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Personal Computer World

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Sony Data Discman



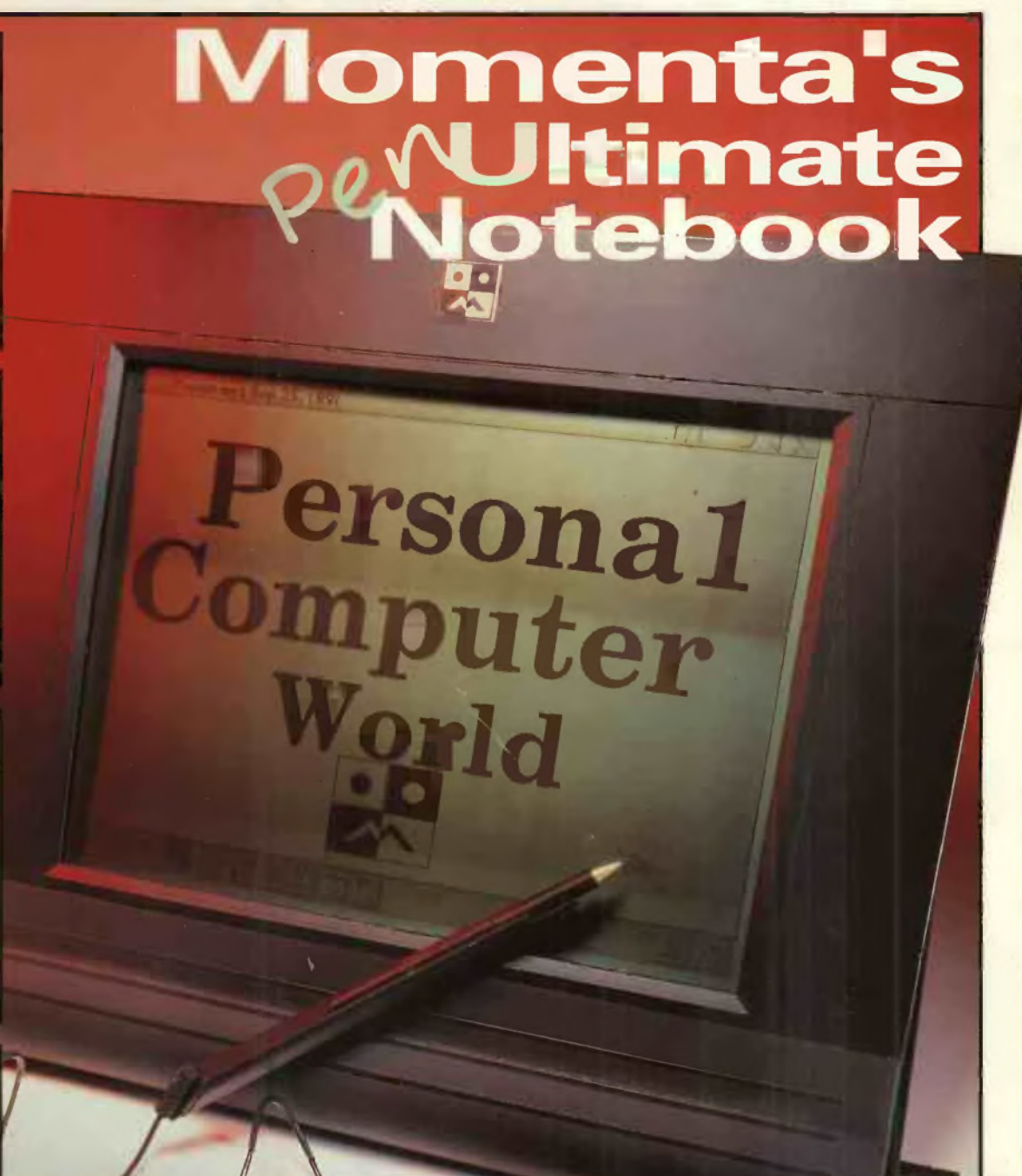
Blyth's Omnis 7 Mac



Presentation Graphics

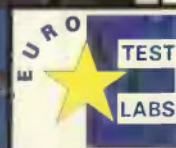


Pocket PCs Group Test



Flight Simulator Add-ons • Harvard Draw for Windows

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COVER FEATURE



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Momena

This machine is the result of a radical rethink in the way people use portable computers. It has a Smalltalk-based user interface and a RISC processor, yet will run DOS and Windows. Simon Rockman was impressed.

Cover photography by Chris Bell.

SOFTWARE BENCHMARKS

Omnis 7 Plus for Mac

Steve Cassidy finds out whether the latest version of an established Mac database has kept abreast of developments in the field.

214

Untouchable

Fifth Generation claims that by using artificial intelligence, its product can spot all new strains of computer virus without crying wolf. Tony Capelli offers his own prognosis.

222

Corel Draw! 2.01 vs Harvard Draw

SPC aimed Harvard Draw squarely at Corel, which has retaliated with version 2.01. Helen Johnstone adjudicates over pixels at dawn.

254



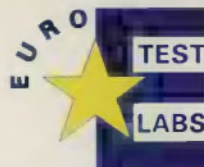
Up, up and away

Since Microsoft's Flight Simulator first took to the air professional

programmers and amateur pilots have sought to improve on the original. Guy Swarbrick looks at new accessories for budding barnstormers.

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FEATURES



228 Euro Test Labs

As the UK's representative in the new Euro Test Labs project, PCW has a new set of benchmark tests. Find out exactly what that means to you.

246 Computers in the woodwork

Xerox' Palo Alto Research Center (PARC) is responsible for a lot more than WIMPs, as Nick Hampshire discovered.

304 High flier

Simon Rockman meets Fred Gibbons, president of the company behind Harvard Graphics and a man with no qualms about drastic reorganisation, swimming with seals or flying a jet fighter.

318 Serial killer

The history of the PC serial port is littered with tales of woe and bad design — and not all of them are the fault of IBM. But it is possible to write reliable serial drivers, as Dan O'Brien explains.

330 Marked improvement

Standard Generalised Markup Language (SGML) is a tool for authors to maintain a common look and feel across other people's work in other companies and countries. It is described here by R Lee Humphreys.

HARDWARE BENCHMARKS

238 Mitsubishi S3600-30

This 300dpi dye-sublimation printer features a British PostScript-compatible interface card and makes it easy to produce photorealistic output from a PC. Guy Swarbrick reports.

266 Data Discman DD1-EX

Getting 200Mb of data onto a disc small enough to fit in a shirt pocket is a neat trick managed by Sony's 'Electronic Book' player. Simon Rockman explores the nearest thing yet to The Hitchhiker's Guide to the Galaxy.

310 Dolch Multimedia PC

Dolch's PC provides mobile multimedia, but you need to do more than mix and match the right components to justify an £8000 price tag. Danny Bradbury got behind the hype.

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HARDWARE GROUP TEST

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Pocket Computers

David Brake

The choice of computers that will fit in your pocket is far more diverse than the range of systems that will fit on your desk. Our team of reviewers looks at the top 16 organisers, vertical-market machines and computers to help you pick a pocket PC.

Canon Wordtank	170	Poqet	188
Casio SF-7500	172	Psion HC100	189
Casio SF-9500	173	Psion Organiser LZ	191
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SOFTWARE GROUP TEST

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Presentation Graphics software

Mat Beard

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However bad your figures, you can make them look good with some showmanship and statistics. Our team of experts looks at 19 leading packages for DOS, Windows and the Mac to see which ones offer the greatest scope for finding silver linings, and which ones will make you even more miserable after an evening spent typing in blob charts.



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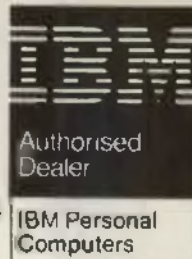
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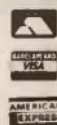
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FLOPPY DISK	N/A	N/A	N/A	N/A	3.5" 1.44MB	3.5" 1.44MB	3.5" 1.44MB	3.5" 1.44MB
HD OPTIONS	N/A	N/A	N/A	N/A	0 OR 52MB	0 OR 52MB	0 OR 52MB	0 OR 52MB
HDI ACCESS TIME	N/A	N/A	N/A	N/A	17MSEC	17MSEC	17MSEC	17MSEC
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CACHE MEMORY	N/A	64K	64K	64K

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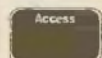
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286 MODELS

286/12

	No HDD	20MB (28ms)	40MB (28ms)	105MB (19ms)	210MB (16ms)	330MB (16ms)
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14" Mono VGA (640x480)	409	509	539	629	829	1239
14" Colour VGA (640x480)	509	609	639	729	929	1339
14" Super VGA (1024x768)	559	659	689	779	979	1389
14" Super VGA (1024x768, non-interlaced)	609	709	739	829	1029	1439

Please add £50 for each additional 1MB of RAM

For 16MHz 286 model please add £20 to the above prices

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SX/16

	No HDD	40MB (28ms)	105MB (19ms)	210MB (16ms)	330MB (16ms)	420MB (14ms)
14" Monochrome (Hercules)	419	549	639	839	1249	1369
14" Mono VGA (640x480)	469	599	689	889	1299	1419
14" Colour VGA (640x480)	569	699	789	989	1399	1519
14" Super VGA (1024x768)	619	749	839	1039	1449	1569
14" Super VGA (1024x768, non-interlaced)	669	799	889	1089	1499	1619

SX/25

	No HDD	40MB (28ms)	105MB (19ms)	210MB (16ms)	330MB (16ms)	420MB (14ms)
14" Monochrome (Hercules)	439	569	659	859	1269	1389
14" Mono VGA (640x480)	489	619	709	909	1319	1439
14" Colour VGA (640x480)	589	719	809	1009	1419	1539
14" Super VGA (1024x768)	639	769	859	1059	1469	1589
14" Super VGA (1024x768, non-interlaced)	689	819	909	1109	1519	1639

Please add £50 for each additional 1MB of RAM

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mini tower case



386DX MODELS

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14" Mono VGA (640x480)	599	729	819	1019	1429	1549
14" Colour VGA (640x480)	699	829	919	1119	1529	1649
14" Super VGA (1024x768)	749	879	969	1169	1579	1699
14" Super VGA (1024x768, non-interlaced)	799	929	1019	1219	1629	1749

DX/40 128K CACHE

	No HDD	40MB (28ms)	105MB (19ms)	210MB (16ms)	330MB (16ms)	420MB (14ms)
14" Monochrome (Hercules)	649	779	869	1069	1479	1599
14" Mono VGA (640x480)	699	829	919	1119	1529	1649
14" Colour VGA (640x480)	799	929	1019	1219	1629	1749
14" Super VGA (1024x768)	849	979	1069	1269	1679	1799
14" Super VGA (1024x768, non-interlaced)	899	1029	1119	1319	1729	1849

Please add £50 for each additional 1MB of RAM

All prices include 2MB RAM expandable to 32MB; 1 floppy drive (1.2MB 5.25" or 1.44MB 3.5" format); 2 serial, 1 parallel and 1 game port; small footprint desktop case with 200W power supply; 102 key enhanced keyboard and 12 months on-site maintenance (UK mainland).

486SX MODEL

486SX/20

	No HDD	40MB (28ms)	105MB (19ms)	210MB (16ms)	330MB (16ms)	420MB (14ms)
14" Monochrome (Hercules)	699	829	919	1119	1529	1649
14" Mono VGA (640x480)	749	879	969	1169	1579	1699
14" Colour VGA (640x480)	849	979	1069	1269	1679	1799
14" Super VGA (1024x768)	899	1029	1119	1319	1729	1849
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14" Colour VGA (640x480)	1099	1229	1319	1519	1929	2049
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14" Colour VGA (640x480)	1349	1479	1569	1769	2179	2299
14" Super VGA (1024x768)	1399	1529	1619	1819	2229	2349
14" Super VGA (1024x768, non-interlaced)	1449	1579	1669	1869	2279	2399

Please add £50 for each additional 1MB of RAM

All prices include 4MB RAM expandable to 32MB; 1 floppy drive (1.2MB 5.25" or 1.44MB 3.5" format); 2 serial, 1 parallel and 1 game port; small footprint desktop case with 200W power supply; 102 key enhanced keyboard and 12 months on-site maintenance (UK mainland).

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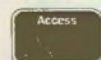
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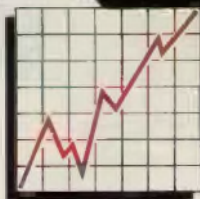
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- Without costly phone bills?
- Use the data within other applications e.g. Lotus 1-2-3?
- Control of the OPT-III & OPT-III/S from your own Basic, C or Pascal programs?

Now you can receive free city news and data including stock and share prices, company results, Wall St. unit trusts, City Newswire, takeover news etc. Also up-to-date world news, sports, what-on, TV/Radio, magazines, holidays, reviews and much more.

Easily print out pages, or save received pages to disk as an ASCII file for use within other programs.

New advanced features include:

- 2-Page Viewing
- Share Scanning
- 16 Page 'Instant' Review
- Mouse Support/Page 'Click'
- AutoSearch/Save of Pages
- SetClock - Auto-set your PC's (or net server's) system clock.

Advanced users will delight in using and controlling the OPT-III Teletext receivers from their own programs - using the acquired pages for analysis, control, data distribution etc.

The OPT-III and OPT-III/S both include a manual, easy-to-use application software, as well as sample programs in Basic and C.

- OPT-III PC Card (internal) £195
- OPT-III/S Receiver (external) £295

Please call for further details.

NEW 'FOTOMAN' CAMERA

FotoMan - the exciting new digital camera for computers!

"... There was no easy, inexpensive way to create graphics of real-world objects at the click of a button - until Logitech released FotoMan."

PC COMPUTING

Take up to 32 pictures. Connect FotoMan to your PC, through the serial port, and easily download your pictures as high-quality gray scale images. There's no film, no developing and no waiting.

'Most Valued Product' Winner PC/Computing Magazine

• What can I do with FotoMan?

Use it as a camera for fieldwork, where instant imaging can save time and money (such as in the real estate and insurance professions). Take pictures anywhere. Create a catalogue of pictures. Add pictures to newsletters, brochures and fliers. Include visual images in databases. Use FotoMan images for multimedia and presentations. Produce personalised stationary, letters, invitations and anything else where you want to include real-life images in your computer documents.

• What about Software?

Preview miniature versions of your images on your PC, select the one you want to use, then edit it with the FotoTouch image editing software (Windows-3 is required). FotoTouch lets you crop the background, adjust the contrast, retouch, lighten, darken and even combine images. Save your edited images (TIFF, PCX, BMP or EPS) and use them in all your applications.

• **PORTABLE** - small, lightweight and battery operated, so you can take pictures anywhere.

• **EASY TO USE** - A comfortable shape and one-button operation

• TAKE PICTURES INDOORS AND OUTDOORS

FotoMan includes a built-in flash for indoor use and a neutral density filter for perfect use outdoors too.

• **COMPATIBLE** - FotoMan works with any PC, portable or notebook with a serial port that is running Windows-3.

"Bringing a high-end capability into an affordable price range"

PC/Computing Dec 1991

• LOGITECH FOTOMAN £485

Please phone for a leaflet.

INTEL FAX CONNECTION CO-PROCESSOR

• NEW LOW PRICE - £495

• **STOP PRESS** - For the more advanced Windows user, the new WINFAX-PRO V2 Windows fax software now available (£99)

"The Connection CoProcessor helps define a standard of excellence for other fax systems to live up to... the Connection CoProcessor is a clear winner."

PC MAG. 'EDITORS CHOICE'

Whether you use DOS or Windows-3, you will be delighted with this advanced state-of-the-art fax card.

With its own on-board 80188 processor with 256K RAM - it is unlike most other fax boards - you can now genuinely do your fax transmitting and receiving in the 'background', without faxes disrupting your workflow.

• 9600 Baud - full Group-III

• On-board 80188CPU/256K RAM

• Full LIM Expanded Memory support - only 6K RAM required

(without fax, memory needs 62K RAM)

• True 'background' operation

• Multiple location transmission

• Schedule transmissions

• Supports most popular printers and scanners

• Transmit compatible with any ASCII text, PCX or DCX files.

FAX-IT FOR WINDOWS! £45

With FAX-it for Windows-3, you can send a fax from ANY Windows application e.g. Word for Windows, Ami, CorelDraw, Superbase, Windows Write etc - a MUST for many Windows-3 users!

FAX-it offers phoneBooks, groups, scheduling, cover sheets, transmit and receive log, view and print faxes etc etc. Save a fax in PCX or TIFF format (perhaps for later use).

• **TRANSMISSION** e.g. OCR, You can even forward a received fax!

WINFAX PRO £99

Winfax Pro is for the more serious user - it offers the same facilities as FAX-it and much more! Advanced features include ASCII phonebook import, the customisation of cover sheets, with Time, Date, Recipients name etc. Full D.D.E. support allows automated use with say Word for Windows, WordPerfect for Windows etc.

"The fax card comes of age with the Intel Connection CoProcessor" PC USER

Please phone for a 'fax' datapak.

CBT SOFTWARE TRAINING

A selection of superb training software offering your pupils from the best training software producers, including American Training International, Individual Training and others.

In addition to the Individual user, these packages have been extremely popular with training organisations, support departments, colleges, universities etc. Optimum CBT (Computer Based Training) offers you an attractive alternative to 'normal' training. (Most standard training companies offer tutor-based training, with 5-10 students per class, and typically charge £150-£300 per day per person).

Optimum's CBT is the fast way to learn, teaching you to use your package to its full potential. With Optimum's CBT training, your own PC becomes a highly qualified personal teacher - it teaches you individually at your own pace. You can also go back for a 'refresher' whenever you like. It can be used again and again, and train many people. Ideal for training, R&D and support departments.

A full range of quality training software is available from Optimum. All our free detailed training leaflets.

- Dynamic Speed Reading £89
- How to Use your PC/AT £59
- How to Use your IBM PS/2 £59
- Individual Training - LANS £99
- Individual Training - Excel £89
- Intro to Business Software £59
- Intro to Database Mgmt £59
- Intro to Word Processing £59
- LAN Administrators Kit £195
- Manage Business with 1-2-3 £89
- Mavis Beacon Typing Tutor £59
- Mavis Beacon Typing Windows £59
- Professor DOS £69
- Professor Windows £69
- Teach Yourself 1-2-3 V2.2 £89
- Teach Yourself 1-2-3 V2.3 £89
- Teach Yourself 1-2-3 V3.1 £89
- Teach Yourself 1-2-3 MacOS £89
- Teach Yourself Database V4 £89
- Teach Yourself dBase-III Plus £89
- Teach Yourself dBase-IV £89
- Teach Yourself DisplayWrite 4 £89
- Teach Yourself DOS 3.3 £59
- Teach Yourself DOS 3.3 £59
- Teach Yourself DOS-5 £59
- Teach Yourself Framework £89
- Teach Yourself Freelance+ £99
- Teach Yourself MS Word V5 £89
- Teach Yourself M'Mate Adv £89
- Teach Yourself Multiplan V2 £89
- Teach Yourself Open Access-II £89
- Teach Yourself Paradox3 £89
- Teach Yourself Pagemaker3 £99
- Teach Yourself Q&A £89
- Teach Yourself Quattro V3 £89
- Teach Yourself PC Tools V7 £89
- Teach Yourself RBase for DOS £89
- Teach Yourself Supercak 5 £89
- Teach Yourself Symphony £89
- Teach Yourself Ventura £99
- Teach Yourself Windows-3 £69
- Teach Yourself W'Perfect 5.1 £89
- T'Yself W'Perf for Windows £89
- Teach Yourself Wordstar 3.3 £89
- Teach Yourself Wordstar Pro4 £89
- Teach Yourself Wordstar 2000+ £89
- Unix/C Course demo available £95

OPTIMUM TECHNOLOGY LTD

Sunny Gardens Parade, Great North Way,
London NW4 1JA ENGLAND

LISTED BELOW IS JUST A SELECTION
FROM OUR WIDE RANGE OF PRODUCTS
(from legitimate UK sources - NO 'GREY' IMPORTS!)

WORD PROCESSORS

AMI V1.2 (Lotus)	£95
AMI Prof V2 - New! (Lotus)	£295
DisplayWrite V5	£295
Grammatik for Windows	£89
Grammatik-IV-UK (Grammar Check)	£89
JustWrite - New! Symantec	£189
Manuscript (UK) V2.1	£275
Multimate 4.0 (UK)	£289
PerFORM V2.1	£99
PerFORM PRO for Windows	£295
Prof Write Plus - New!	£195
Word V5.5 UK - MS (UK)	£259
Word V5.5 Network	£895
Word for Windows V2 UK	£259
Word for Windows Net	£1145
Word for Word Professional	£95
Word for Word Pro Windows	£95
WordPerfect Upgrades etc	£CALL
WordPerfect for Windows	£219
WordPerfect V5.1 (UK)	£219
WordPerfect LetterPerfect	£149
WordPerfect Office 3-PC	£95
WordPerfect Office 3-Net	£POA
Wordstar for Windows	£235
Wordstar V6 UK	£235
Wordstar Net Server/Users	£CALL
Wordstar 2000+ Ref3.5 (UK)	£295

DATABASES

ACT 2.1 Contact Management - NEW!	£369
Agenda V2	£289
Cardbox Plus	£295
DataEase V4.5 (UK)	£439
DataEase Network (3 User)	£579
DataPerfect V2.2 (Microsoft)	£289
dBase III Plus V1.1 (UK)	£389
dBASE-4 V1.1 (UK)	£395
dBASE-4 V1.1 Dev Ed. (UK)	£745
dBASE-4 V1.1 Lan Pak	£745
Clipper V5.01 (UK)	£349
Delta-V Rel2 - Compsort	£439
FormBase (Xerox)	£369
Foxbase Plus V2.1	£245
Foxbase Plus V2.1 Multi-User	£389
Foxbase Plus V2.1 Developer	£449
Foxbase Plus/386 V2.1	£349
Foxbase+/386 V2.1 Devel.	£549
FoxPro V2 UK	£449
FoxPro V2 UK Multi-User	£649
FoxPro Distribution Kit	£295
Object-Vision V2 - NEW!	£65
Omnis-5 for Windows	£529
Paradox V3.5 (UK)	£289
Paradox Network Node	£145
Professional File V2	£169
Q & A V4 - NEW!	£249
Q & A V4 Network - 3 User Pack	£249
Rapidfile V1.2	£239
rBase V3.1	£439
rBase Personal - New!	£139
Reflex V2.0	£195
Superbase-2 (Windows)	£239
Superbase-4 V1.3 (Windows)	£395
Superbase-4 V1.3 Developer Ed.	£795
Superbase-4 5-user Runtime	£179
Superbase-4 V1.3 LAN (5 user)	£745
TAS Professional - Single User	£445

SPREADSHEETS

Excel V3 Microsoft	£249
Excel Lan (5 User Pack)	£1145
Impress V2L	£125
Logistix V1.3	£135
Lotus 1-2-3 for Windows	£319
Lotus 1-2-3 2.3	£249
Lotus 1-2-3 2.3 Net Server	£439
Lotus 1-2-3 2.3 Net User	£239
Lotus 1-2-3 3.1+ 286/386/486	£299
Lotus 1-2-3 3.1+ Net Server	£489
Lotus 1-2-3 3.1+ Net User	£289
Multiplan V4.2 - Microsoft	£129
PlanPerfect V5.1 (Microsoft)	£269
Quattro Pro V3	£195
Quattro Pro V3 Competitive Upgrade	£65
Supercalc-5.1 (UK)	£77
Supercalc-5.1 LAN (3 User Pack)	£195
Wingz V1.1 (UK) - Informix	£329

INTEGRATED PACKAGES

CA SuperOffice - New!	£125
Framework V4	£375
MS Office for Windows	£489
PFS:Windows Works	£139
Smartware-II V1.5 (UK)	£395
Symphony V2.2	£389
Works for Windows - MS	£129
Works V2.0 - MS	£129
Xchange - Pison (UK)	£439

PROJECT

ABC Flowchart V1.1	£249
Harvard Project Manager-III	£539
Logistix V1.3	£135
Instant Org-Charting - New!	£185
Microsoft Project V4	£245
MS Project for Windows New	£369
ON-TARGET - NEW! Symantec	£245
Quick Schedule Plus	£79
SuperProject Expert V2	£589
SuperProject for Windows	£589
Time-Line V4 NEW (UK) Symantec	£469

DATA MANAGEMENT

ABC Flowchart V1.1	£249
ACT 2.1 Contact Management - New!	£375
Access Dragnet (Data Recovery)	£95
Access Prompt (Data Manager)	£95
Agenda V2 (UK) - Lotus	£289
Grandview V2 (UK) - NEW! Symantec	£269
iIBM Current V1.11	£289
Lotus Magellan V2.0	£99
Lotus SmartText Builder Dev Sys	£445
Lotus SmartText Reader	£95
PC Guide V3 - Hypertext	£449
PC Guide Reader	£95
Portex Professional	£129
Portex Prof Net 8-User	£795
Statgraphics V5 - New!	£529
VP Expert V2.0	£185

W - signifies a Windows or a Windows associated product.

MARCH'S OPTIMUM CHOICE

FREE 'FLOPPY CALC' IS BACK!

Back by popular demand is the 'Floppy Calc', a great free gift, a 'thank you' for your custom, from Optimum. It is not really hardware - it is not really software! The unique 'limited edition' Optimum Floppy Calculator - a superb seven function solar powered calculator with a unique attractive hi-tech design.

Free with your order over
£50 (+ carr & VAT - one per customer - while stocks last.)

STACKER 2.0 DISK DOUBLER

Is your hard disk too small? Stacker is the ideal solution for: personal computer users who are running out of hard disk space, laptop and notebook users considering expensive hard disk upgrades, and, corporations facing heavy equipment upgrades to satisfy the huge storage demands of today's programs.

"But there is another way. For providing a solution that's fast, simple, inexpensive, and clever, Stacker 2.0 gets an MVP (Most Valued Product) award.... so you can put off that new hard disk - just make your old drive bigger."

PC/Computing Dec 1991 Stacker 2.0 instantly and safely doubles your disk capacity so you can do more with your personal computer today. Stacker saves you money by avoiding costly and difficult hard disk upgrades. Stacker works invisibly. The built-in Stacker Cache improves performance.

Stacker is available as software only, or with dedicated compression cards for the fastest possible operation and best compression. Please phone for a detailed leaflet.

NEW OPT-III/S EXTERNAL TELETEXT RECEIVER

Just been released! - The OPT-III/S Teletext Receiver - it can be driven from any PC, notebook or terminal with a serial port. Brings free Teletext data to even more users! - Please call for a detailed leaflet.

OPTIMUM AND NOVELL!

Optimum are delighted to confirm that we are now a full Novell UK Authorised Dealer. Please call us with all your Novell software and upgrades requirements, all offered at excellent discounts!

AVERY LABELPRO - NEW!

The impression a sharp stunning laser printed label can make is recognised. Avery laser labels are freely available from most office stationary suppliers - however the problem has always been how to print on them. Avery have just launched this new product.

"Labelling software for use with HP and Postscript printers. Supports .PCX and .PGC graphic files and WordPerfect, Word, Wordstar and dBase formats.... Easy to use with a good range of templates, library of clip-art, and selection of scalable fonts. Prints well on a variety of labels."

PERSONAL COMPUTER MAGAZINE LabelPro does only one thing. It enables you to design labels and print them on a laser printer - many packages can output to laser labels - in theory anyway! LabelPro does it easily - and it does it extremely well - even bar codes!

The ability to merge databases with label designs is a handy feature. Data entered in dBase, WordPerfect, Word, Wordstar or comma-delimited files can be combined with a label design, so you don't have to create a separate label for each piece of data.

The software is compatible with HP LaserJet, Deskjet, Xerox 4045, Canon, Postscript printers etc etc. Please call for a leaflet.

MICROGRAFX DESIGNER WITH EVEN MORE!

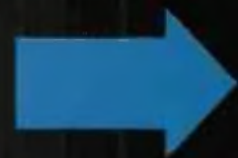
The outstanding Windows-3 graphics package now has even more.

This latest 'plus' version now includes Adobe Type Manager, Adobe Type Align and more than 175 of the industries best fonts, all at no extra cost.

OPTIMUM SALES DESK

Telephone: 081-203 0220

Fax: 081-203 7004



See next page



OPTIMUM

OPTIMUM TECHNOLOGY MORE THAN JUST LOWER PRICES!

UTILITIES/MISC

386Max V6 - New!	£65
Adobe Type Mgr/Plus	£79/£139
AutoRoute Express - New!	£49
AutoRoute Plus V4	£279
AutoRoute Products - call for prices	
Avery LabelPro - New!	£99
Battery Watch Pro	£35
BridgeBatch (New!) - New!	£119
CHECKIT V3 PC Diagnostics	£95
Dan Bricklin's Demo-II V3	£195
DESQview V2.4 - New!	£85
DESQview 386 V2.4 inc OEMM	£145
DESQview Manifest	£39
DESQview ORAM 286 V2	£65
DESQview OEMM 386 V6	£65
DESQview OEMM 50/60	£65
Direct Access V5 (5th Gen.)	£65
DOS V5 Upgrade (Microsoft)	£59
DR Dos V6 - New!	£75
Dr Solomons Anti Virus V5	£95
Dr Solomons "Corporate"	£289
FAST! - Power Windows/Dos disk cache	£79
Fastback Plus V3 - New!	£99
Flight Simulator V4.0B	£35
HDC Windows each as below	£89
1st Appl. Windows Express, File Appl. Icon Designer	
Lap-Link Pro V4 - New!	£99
NewWave V3 (HPI) - New!	£95
Norton Anti-Virus V1.5 (UK)	£135
Norton Backup V1.2	£89
Norton Commander V3	£89
Norton Desktop for Windows	£95
Norton Editor V2	£59
Norton Utilities V6	£115
PC KWIK POWER PACK V2.1	£89
PC Tools Deluxe V7 - NEW!	£99
Pegasus Easyfacts Accounts	£195
Pegasus Business Manager	£289
Sage Sterling for Windows	£289
Sage Sterling Acc/Acc+ £239/339	
Sage Sterling Fin Controller	£449
Sage Sterling Payroll-II	£169
Sideways V3.3	£55
Sideways V2 - New!	£75
SPINRITE-II V2 - NEW!	£79
Stacker V2 Software	£95
Stacker V2 + AT Processor	£149
StoryBoard Live! (IBM)	£345
Superprint V2 for HP (New)	£119
TOOLBOOK V1.5 - NEW!	£269
TURBOCASH PLUS - NEW!	£179
WinConnect - New!	£79
WINDOWS-3 (UK)	£79
WINDOWS-3 Dev Toolkit	£295
Windows Entertainment Pk	£29
Windows Productivity Pack	£45
WordPerfect Office V3/PC	£95
Xtree Pro Gold V2.5 - NEW!	£95
Xtree Network (Novell only)	£295

SOUND/VIDEO BOARDS

Hercules Graphics Plus	£185
Hercules Graphics Station	£589
Hercules G/Station 2400 (IBM)	£795
Hercules Graph.Station PS/2	£745
SoundBlaster V2 - New!	£139
SoundBlaster Pro - New!	£189
Video-7 VGA 1024i 512K	£145
Video-7 VRAM-II 512K	£245
Video-7 VRAM-II 1MB	£295

CAD / DTP & GRAPHICS

ABC Flowchart V1.1	£249
Adobe Type Mgr/Plus	£79/£139
Animator/Pro	£279/£479
Arts & Letters Editor V1.3	£395
AutoSketch V3	£95
CA Windows Graph	£159
CA Windows Presents	£249
CorelDraw V2.01 (UK Pat Video)	£245
CorelDraw Upgrade with disk	£89
Dan Bricklin's Demo-II V3	£195
DeskPRESS (TimeWork Pro) - NEW!	£189
DoDot screen Grab/Conversion	£125
Drafix CAD for Win3 V1.1	£495
Drafix Cad Ultra V4	£295
Drafix Accessories	£POA
DrawPerfect V1.1 (WordPerfect)	£279
DR Artline V2	£349
DR Desktop Publisher V2	£289
DR Draw Plus/Graph	£165/£165
DR Presentation Team-I	£349
DR WordChart	£125
Freedom of the Press V2.2	£249
Freelance for Windows	£325
Freelance Plus V4 (UK)	£289
Graphwriter-II - Lotus	£329
Harvard Draw for Windows	£295
Harvard Graphics V3 - New!	£295
Harvard Graphics for Windows	£295
Hijack V2 (Sophisticated graphics conversion utility and capture the Win3 captured)	£125
Hollywood - IBM - New!	£345
Import for Windows	£189
Micrografix Charisma	£295
Micrografix Clip-Art	£POA
Micrografix Designer-V3.1+	£379
Micrografix Draw for Win	£99
PageMaker V4 - Aldus (UK)	£479
PC Paintbrush V4/V4+ £79/£129	
PC Publishers Paintbrush V2	£289
PC Publishers Typefoundry	£289
PerFORM PRO - Windows	£369
PerFORM V2.1	£99
Persuasion for PC - Aldus	£295
PowerPoint for Windows	£295
Storyboard Live!	£345
SuperPrint V2 for HP	£119
TimeWorks V2 NEW inc OEM	£125
Ventura Gold Gem	£495
Ventura V4 for Windows - New!	£495
Ventura Accessories	£CALL
WordScan Plus OCR	£679
ZSoft SoftType (Fonts)	£139

LOTUS cc:MAIL

Call for pricing/advice on other cc:MAIL products.	
MS-DOS Platform Pack	£139
Windows Platform Pack	£349
Gateway	£895
Remote	£195
cc:FAX	£1395

OPT-III TELETEXT RECEIVERS

OPT-III Teletext Receiver	£195
OPT-III/S External Receiver	£295

NOVELL

Optimum are Novell UK Authorized Dealers. Please call for all your upgrades and other requirements.

All Netware Upgrades	£CALL
Netware Lite (New)	£65
Netware 2.2 5 user	£399
Netware 2.2 10 user	£965
Netware 2.2 50 user	£1675
Netware 2.2 100 user	£2695
Netware 386 3.11 10 user	£1245
Netware 386 3.11 20 user	£1675
Netware 386 3.11 100 user	£3895
Netware 386 3.11 250 user	£6400
NE1000/NE2000	£119/£149
NE2/NE2-32	£295/£695
Intel EtherExpress 16 bit/byte	£199

PROGRAMMING

BORLAND:	
Borland C++ V3 (Windows-3)	£249
Borland C++ V3 + AFX	£395
ObjectVision V2	£65
Turbo C++ V2/4-T-Vision	£65/£89
Turbo C++ for Win	£99
Turbo Debug/Tools	£99
Turbo Pascal V6/Prof	£79/£149
Turbo Pascal for Windows	£125
MISC:	
Toolbook V1.5	£249
BridgeBatch - New!	£119

MICROSOFT:	
Basic V7.1 PDS	£269
C Compiler V6 PDS	£239
Cobol V4 PDS	£445
Fortran V5.1	£279
Macro-Assembler V6	£85
Pascal V4	£195
Quick-Basic V4.5	£69
Quick C for Windows	£129
Quick-C V2.5/Pascal	£69/£69
VISUAL-BASIC - NEW!	£125
Windows-3 Software Dev Kit	£295

MICE/SCANNERS & FOTOMAN

Logi Fotoman - New!	£485
Logi ScanMan 256 - NEW!	£199
Logi ScanMan 256/PS2	£269
Logi ScanMan 32+ New! 400dpi	£119
Logi ScanMan 32+ PS/2	£189
Logi CatchWord V1.1 OCR	£139
WordScan OCR	£495
WordScan Plus OCR	£679
Logitech MouseMan	£65
Logitech TrackMan	£115
Logitech TrackManNew/RS232C/PS2	£79

from Logi - Hi-Tech Trackerball "15,000 dpi" + Software	
Logitech Trackman "Portable"	£95
MS BallPoint - Trackerball	£119
MS Mouse - Standard RS232C/PS2	£89
MS Mouse - Standard - Bus	£89
MS Mouse+Windows 3 RS232	£129
MS Mouse+Windows 3 - Bus	£129
PC Mouse-III - RS232 Mouse Systems	£89
PC Mouse-III - Bus Mouse Systems	£89
PC Mouse-III - Optical Resolution up to 30000 C.P.I	
PC TrackBall Serial or Bus	£95
Sharp Colour Mini-Scanner	£479

MATHS CO-PROC MEMORY CARDS & INTEL FAX

Maths Co-Processors

Cyrix offers full IEEE compatibility and up to three times normal co-processor performance. Supplied complete with instructions and diagnostics disk.

Cyrix Fasmath 287XL 6-20MHz	£79
Cyrix Fasmath 287XLT 6-20MHz	£79
Cyrix Fasmath 387SX 16-25MHz	£119
Cyrix Fasmath 387 16-40MHz	£189

Intel offers you the "original" with a full 5 year UK warranty.

Intel 8087	£75
Intel 8087-1	£135
Intel 8087-2	£99
Intel 80287-XLT	£99
Intel 80287-XLT	£99
Intel 80387-SX 16-20MHz	£139
Intel 80387 16-33MHz	£149
Intel 80487-SX	£395

Intel Memory Upgrades

Standard Above Board for PC's. All are running up to 12.5MHz. PS/2 Model 80, Compact 386 etc. with EMM

Above Board Plus 512K	£345
Above Board Plus 1MB	£425
Above Board Plus-8 2MB	£495
Above Board Plus-8 4MB	£595
Above Board Plus-8 6MB	£695
Above Board Plus-8 8MB	£795

MC5060 for PS/2 Models 50, 60, 80 with EMS etc.

Abv Board MC50/60 512K	£365
Abv Board MC50/60 2MB	£495
Abv Board MC50/60 4MB	£595
Abv Board MC50/60 6MB	£695
Abv Board MC50/60 8MB	£795

MC7080 for PS/2 Models 70 & 80 - fast zero-wait state. EMS etc.

Abv Board MC70/80 2MB	£569
Abv Board MC70/80 4MB	£669
Abv Board MC70/80 8MB	£869

386 UPGRADE

(For IBM PC/AT only)

INBOARD 386/PC 1MB	£495
1MB Piggyback Card	£379

Memory Expansion and Co-Processors for 386/PC £CALL

SNAP-IN 386 - NEW!

386/20MHz + 16K Cache. Just released from Intel is this unique easy-to-fit upgrade for PS/2 Model 50 and Model 60 users. Offers stunning speed improvements. Please call for a leaflet.

NETPORT - New!

The self-contained print server for Netware from Intel. Please phone/write for leaflet.

NetPort	£479
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CONNECTION COPROCESSOR

This is perhaps the 'ultimate' fax card, with a built-in 80188 CPU and 256K RAM for genuine 'background' operation. Requires on 6K of RAM (expanded) or 62K conventional. Please phone/write for a leaflet.

Connection Co-Processor	£495
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Faxit for Windows

WINFAX PRO V2 - New from Deltek	£99
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Advanced Fax Windows Software for Intel

w - signifies a Windows or a Windows associated product.

OPTIMUM TECHNOLOGY LTD
Sunny Gardens Parade, Great North Way,
London NW4 1JA ENGLAND

Sales Desk: Phone 081-203 0220 Fax 081-203 7004

See previous page

LISTED BELOW IS JUST A SELECTION
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(from legitimate UK sources - NO 'GREY' IMPORTS!)

COMMS NOTES

* MODEM CODES & SPEEDS (B.P.S.)
a = V21 - 300bps (CCITT)
b = V22 - 1200bps (CCITT)
c = V22 - 1200bps (CCITT)
d = V22bis - 2400bps (CCITT)
e = V-Series Hayes 'Express' 9600 Special
f = HST - 9600bps US Robotics Special
g = V32 - 9600bps (CCITT)
h = V32bis - 14400bps (CCITT)
i = HST - 14,400bps US Robotics Special

* ERROR CORRECTION/COMPRESSION
MNP-4 = Error Correction
MNP-5 = Compression - up to 2:1
V42 = Error Correction (CCITT) - +MNP-4
V42bis = Compression (CCITT) - up to 6:1

MODEM FEATURES:
All our modems feature Auto-Dial & Auto-Answer and they have full BABT approval.
As Hayes Authorized Dealers, we supply genuine Hayes modems - they really are 'Hayes Compatible', and may well be your first choice.
All other modems are 'Hayes-AT' compatible i.e. they are broadly compatible with the Hayes ASCII Command Set.
Please feel free to phone/write for advice all your 'dial-up' modem/comm requirements - let us help you choose your modem and comm software.

COMMS SOFTWARE

Carbon Copy for Windows £139
Carbon Copy Plus V6 - NEW! £125
ccMail - see previous page
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Crosstalk-Mk4 - V2 £129
Crosstalk-16 V3.71 UK £95
Crosstalk for Windows V1.1 £95
DataTalk V3.3 £125
DATATALK V4 - MNP £179
MIRROR-III UK with MNP-5 £169
Mirror-III Takeover (remote) £189
PC Anywhere V4 £129
Procom Plus V2 - NEW! £95
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Smartcom Exec V2.1 (Hayes) £129
Smartcom-III V2 (Hayes) £129
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Smartterm 400/470 £125/£225
Smartterm 420 for Windows £195
TALKING WINDOWS - NEW £239

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FaxNOW! for 2496 £145
FaxNOW! # purchased with 2496 £95

OPT-III TELETEXT RECEIVERS

OPT-III Teletext Card £195
OPT-III Teletext Receiver £295

W - signifies a Windows or a Windows associated product.

COMMS HARDWARE

a selection of available modems

Modem to PC cable (25w) £15 AT (9w) £23

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GOLD PC4/FAX (a,b,c,d) + MNP5/V42 £549
GOLD MCA4 (a,b,c,d) + MNP5/V42 + software £489
GOLD MCA4/FAX as above + send-only fax £589

DATAFLEX: (Full Dataflex product range available)
PC Stradcom (a,c) Internal £145
Pocket Stradcom-II + Software (a,c) £175
PC Biscom (a,c,d) + Software £195
Pocket Biscom (a,c,d) + Software £289
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PC Quadcom (a,b,c,d) Internal £285
Pocket Quadcom (a,b,c,d) + Software £375
PC Rapier (a,c,d,g) + MNP5 + V42bis Internal £495

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Quattro/Ext "Classic" (a,b,c,d) + MNP-2 £495
QuattroCard Int. "Classic" (a,b,c,d) + MNP-2 £545
Quattro/PC - NEW! (a,b,c,d) + MNP5/V42/V42bis £579
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COURIER HST DUAL as HST + g,h £845

OPT-III Teletext PC Card £195

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Uninet 12 (a,b,c) (also as internal) £225
Uninet 24 (a,b,c,d) (also as internal) £295
Uninet Quad (a,b,c,d) + V42 £349
Uninet V32 (c,d,g) + MNP5/V42/V42bis £549

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MARCH'S OPTIMUM CHOICE cont....

THE OPT-III TELETEXT RECEIVERS

*** STOP PRESS!!!

NEW EXTERNAL TELETEXT RECEIVER JUST LAUNCHED!

Please see the first page of our advertisement for further details of this exciting new product.

The OPT-III Teletext receiver card, allows you to receive and use Teletext data, from Ceefax and Oracle etc.

Features now include:

• **Twin Page Viewing** - you can now optionally watch two pages from a TV channel simultaneously (EGA/VGA) - and Yes! - they both continually update. So you can watch the news headlines on the left with share prices on the right.

• **Share Scanning** - you can scan the teletext share pages for share names previously specified - and automatically save the share names and prices to disk as an ASCII file.

• **Page Review** - Instant 16-page review.

• **Mouse Support**

• **SetClock** - set internal PC (net?) Clock from the Teletext accurate clock signal (perhaps from AutoExec®).

• **Page Click**

• **Reduced Size** - now a half-sized card.

The OPT-III is a unique advanced Teletext receiver that fits inside your IBM-PC.

Why the OPT-III Teletext Card? - Perhaps 'live' data for use within your applications? Possibly automatic keyword search (and manipulation) of 'live' data. Perhaps automatic share portfolio monitoring? share portfolio monitoring?

Now you can gain from free city news and data including stock and share prices, company results, Wall St, foreign exchanges, world markets, unit trusts, City Newsfile, takeover news etc. As well as up-to-date world news, sports, whats-on, TV/Radio, magazines, holidays, reviews etc. Simply insert this precision half-sized card into your IBM/PC, (line PS/2 model 30) AT, '386 or 486, and plug in a television antenna.

Fully featured advanced circuitry includes software controlled 'closed-loop' digital tuning ensuring both accuracy and reliability.

Advanced software allows you to save a received page to disk as an ASCII file for use within other programs. You can print out pages. You can save the data to disk (as raw data or as an ASCII file).

An advanced routine allows you to automatically search and save to disk (as an ASCII file) specified sequences of pages and sub-pages on a mixture of TV channels - you can even specify times.

If your interest is the financial pages, you can scan specified pages for share names of interest - the OPT-III software will produce an ASCII file, clearly listing the names of the shares and their prices.

Advanced users will delight in using and controlling the OPT-III Teletext receiver using the supplied device driver from their own programs - using the acquired pages for analysis, control, data distribution or other processing.

Typical applications include:

• 'Prices-on-the-Move' - one user is automatically 'bleeped', via modem, on his RadioPager every hour with his shares portfolio pricing.
• 'Network News' - one network manager has delighted users by offering a free 'real-time' news service down the network.

The OPT-III package includes a precision half sized PC card, manual, easy-to-use application software, as well as sample programs for the programmers amongst you in Basic and C.

The OPT-III is available now for only £195 (+£5 carriage + VAT). A comprehensive leaflet is available on request.

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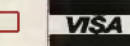
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Card

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An Express service is sometimes available for 'that urgent order'. Please phone for pricing.
Export Carriage: Please contact us for charges. No VAT!

Please Note: Remember to specify disk format - 3.5" or 5.25". All goods are for IBM-PC & 100% compatibles. Prices/Specifications are liable to change without notice.

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This is an intelligent controller that uses its own 80186 microprocessor to free your computer's CPU from sitting around and waiting for the disk. Cache memory size 1MB (max 16MB).

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Computer Buyer, AUG 91

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WHAT,
MICRO?
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Dan-386c/33

Dan-486c/33
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MONITOR	14" mono VGA	14" colour SVGA	17" colour SVGA non-interlaced
NO HDD	£ 890	1044	1519
40MB/28ms IDE	£1061	1215	1690
88MB/19ms IDE	£1145	1298	1773
125MB/19ms IDE	£1227	1380	1855
210MB/15ms IDE	£1388	1541	2016
420MB/14ms IDE	£1742	1895	2370
660MB/15ms SCSI	£2026	2180	2655

Subtract £40.00 from mono VGA price for mono Hercules.
Add £42.00 for every additional 1MB RAM.

Dan-486SX/20
64K CACHE SYSTEM

£594

• 20MHz Main board with i80486SX-20 Microprocessor, AMI BIOS, 64KB (upgradable to 256KB) cache memory & Shadow RAM for System & Video BIOS • 1MB RAM (32MB max)

MONITOR	14" mono VGA	14" colour SVGA	17" colour SVGA non-interlaced
NO HDD	£ 708	862	1337
40MB/28ms IDE	£ 879	1033	1508
88MB/19ms IDE	£ 963	1116	1591
125MB/19ms IDE	£1045	1198	1673
210MB/15ms IDE	£1206	1359	1834
420MB/14ms IDE	£1560	1713	2188
660MB/15ms SCSI	£1844	1998	2473

Subtract £40.00 from mono VGA price for mono Hercules.
Add £42.00 for every additional 1MB RAM.

Dan-386c/40
64K CACHE SYSTEM

£527

• 40MHz Main board with 80386-40 Microprocessor, AMI BIOS, 64KB (upgradable to 256KB) cache memory & Shadow RAM for System & Video BIOS • 1MB RAM (32MB max)

MONITOR	14" mono VGA	14" colour SVGA	17" colour SVGA non-interlaced
NO HDD	£ 641	795	1270
40MB/28ms IDE	£ 812	966	1441
88MB/19ms IDE	£ 896	1049	1524
125MB/19ms IDE	£ 978	1131	1608
210MB/15ms IDE	£1139	1292	1767
420MB/14ms IDE	£1493	1646	2121
660MB/15ms SCSI	£1777	1931	2406

Subtract £40.00 from mono VGA price for mono Hercules.
Add £42.00 for every additional 1MB RAM.

Dan-386c/33
64K CACHE SYSTEM

£516

• 33MHz Main board with 80386-33 Microprocessor, AMI BIOS, 64KB (upgradable to 256KB) cache memory & Shadow RAM for System & Video BIOS • 1MB RAM (32MB max)

MONITOR	14" mono VGA	14" colour SVGA	17" colour SVGA non-interlaced
NO HDD	£ 630	784	1259
40MB/28ms IDE	£ 801	955	1430
88MB/19ms IDE	£ 885	1038	1513
125MB/19ms IDE	£ 967	1120	1595
210MB/15ms IDE	£1128	1281	1756
420MB/14ms IDE	£1482	1635	2110
660MB/15ms SCSI	£1766	1920	2395

Subtract £40.00 from mono VGA price for mono Hercules.
Add £42.00 for every additional 1MB RAM.

Dan-386/25
SYSTEM

£431

• 25MHz Zero wait state main board with 80386-25 Microprocessor, AMI BIOS, Shadow RAM for System & Video BIOS • 1MB RAM (8MB)

MONITOR	14" mono VGA	14" colour SVGA	17" colour SVGA non-interlaced
NO HDD	£ 545	699	1174
40MB/28ms IDE	£ 716	870	1345
88MB/19ms IDE	£ 800	953	1428
125MB/19ms IDE	£ 882	1035	1510
210MB/15ms IDE	£1043	1196	1671
420MB/14ms IDE	£1397	1550	2025
660MB/15ms SCSI	£1681	1835	2310

Subtract £40.00 from mono VGA price for mono Hercules.
Add £42.00 for every additional 1MB RAM.

Dan-386sx/25
SYSTEM

£343

• 25MHz Zero wait state main board with 80386SX-25 Microprocessor, AMI BIOS, Shadow RAM for System & Video BIOS • 1MB RAM on board (16MB)

MONITOR	14" mono VGA	14" colour SVGA	17" colour SVGA non-interlaced
NO HDD	£ 457	611	1086
40MB/28ms IDE	£ 628	782	1257
88MB/19ms IDE	£ 712	865	1340
125MB/19ms IDE	£ 794	947	1422
210MB/15ms IDE	£ 955	1108	1583
420MB/14ms IDE	£1309	1462	1937
660MB/15ms SCSI	£1593	1747	2222

Subtract £40.00 from mono VGA price for mono Hercules.
Add £42.00 for every additional 1MB RAM.

Dan-286/12s
SPECIAL OFFER SYSTEM

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• 12MHz Zero wait state main board with 80286-12 Microprocessor & AMI BIOS, EMS LIM 4.0 • 1MB RAM on board (expandable to 4MB) • 200W Power supply • Small footprint case • 102 UK Keyboard • 1.44MB Floppy drive • IDE Hard & Floppy disk controller • 1 Parallel & 2 Serial ports.

14" MONITOR	mono	mono VGA	Colour VGA
NO HDD	£ 315	360	473
40MB/28ms MS DOS 5	£488	£588	

All systems include the following as standard:

• Small footprint case • 200W Power supply • 102 UK Keyboard • 1.44MB Floppy drive • IDE Hard & Floppy disk controller • 1 Parallel & 2 Serial ports.

Dan-386SX/20NB
NOTEBOOK

£1199

VGA
4MB
40MB

• 20MHz Zero wait state main board with 80386SX-20 Microprocessor, AWARD BIOS, Shadow RAM for System & Video BIOS • Backlit LCD VGA display • Nap & Sleep mode for battery saving • 1.44MB Floppy drive • 1

Serial, 1 Parallel & 1 mouse port • Mains adaptor/charger (110-240V) • MS-DOS 5 • Size: 5.5(H)x28.5(W)x22(D) • Weight: 3Kg • Options for maths co-processor, external keyboard, monitor & scanner.

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Maths co-processors for all systems	P.O.A.

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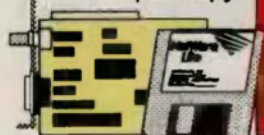
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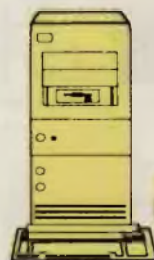
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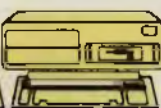
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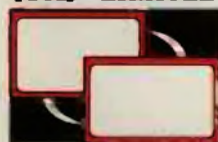
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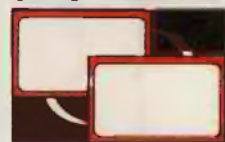
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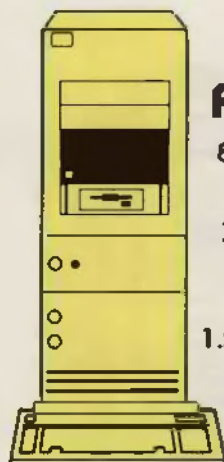
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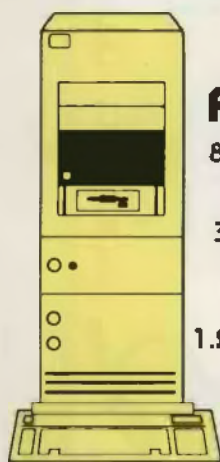


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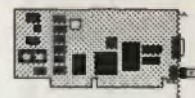
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135Mb (17ms)	£1295	£1345	£1495
180Mb (16ms)	£1395	£1445	£1595
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135Mb (17ms)	£1195	£1240	£1395
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135Mb (17ms)	£1095	£1145	£1295
180Mb (16ms)	£1195	£1245	£1395
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MONITOR	14"	MONO	Colour
	MONO	VGA	SVGA
44Mb (28ms)	£655	£695	£945
90Mb (19ms)	£755	£795	£945
135Mb (17ms)	£855	£895	£1045
180Mb (16ms)	£955	£995	£1145

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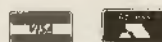
MONITOR	14"	VGA	Colour
	MONO	MONO	SVGA
44Mb (28ms)	£495	£565	£735
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PS/2 System Units

Model	CPU	MHz	H/Disk	
UK Keyboard				£138
35-040	386sx	20	—	£939
35-043	386sx	20	40Mb	£1062
35-14X	386sx	20	ETHERN	£859
35-24X	386sx	20	T/RING	£1039
40-043	386sx	20	40Mb	£1199
40-045	386sx	20	80Mb	£1399
55-LEO	386sx	16	ETHERN	£794
55-LTO	386sx	16	T/RING	£924
55-041	386sx	16	40Mb	£1069
55-081	386sx	16	80Mb	£1259
55-161	386sx	16	160Mb	£1599
56-043	386sx	20	40Mb	£1189
56-045	386sx	20	80Mb	£1389
56-A49	386sx	20	160Mb	£1782

PS/2 System Units (CONTINUED)

Model	CPU	MHz	H/Disk	
56-24X	386sx	20	—	£1184
57-045	386sx	20	80Mb	£1546
57-A49	386sx	20	160Mb	£2223
57-255	386SLC	20	80Mb	£2622
65-061	386sx	16	60Mb	£1493
65-121	386sx	16	120Mb	£1688
65-S31	386sx	16	320Mb	£2375
70-M61	386	20	60Mb	£1599
70-081	386	20	80Mb	£1699
70-121	386	20	120Mb	£1947
70-161	386	20	160Mb	£2029
70-A21	386	25	120Mb	£2239
70-A16	386	25	160Mb	£2429
70-R21	486	25	120Mb	£3209
80-M81	386	20	80Mb	£2037
80-M16	386	20	160Mb	£2369
80-M21	386	20	320Mb	£3059
80-A16	386	25	160Mb	£2749
80-A31	386	25	320Mb	£3439
90-A05	486sx	20	80Mb	£2299
90-A09	486sx	20	160Mb	£2794
90-AH5	486sx	25	80Mb	£2726
90-AH9	486sx	25	160Mb	£3299
90-AJ9	486	25	160Mb	£3799
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95-AHF	486sx	25	400Mb	£4969
95-AJ9	486	25	160Mb	£4459
95-AJD	486	25	320Mb	£5139
95-AJF	486	25	400Mb	£5479
95-AK9	486	33	160Mb	£5779
95-AKD	486	33	320Mb	£6499
95-AKF	486	33	400Mb	£6799
95-VO1	486	33	800Mb	£8869

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Model	CPU	MHz	H/Disk	
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ALT286-40	286	16	40Mb	£849
ALT386sx-40	386sx	16	80Mb	£1109
ANB386sx-20	386sx	16	20Mb	£928
ANB386sx-40	386sx	20	40Mb	£1157
ACL386sx Col.	386	20	120Mb	£3039
IBM				
N33sx	386sx	12	40Mb	£1189
L40sx	386sx	20	60Mb	£1795
L40sx-E45	386sx	20	80Mb	£2099
PANASONIC				
CF270-20	286	16	20Mb	£1015
CF270-20	286	16	60Mb	£1249
CF370-60	386sx	20	60Mb	£1789
SANYO				
NB17-60	286	12	60Mb	£1229
NB18-20	386sx	20	20Mb	£1329
NB18-60	386sx	20	60Mb	£1429
NB18-80	386sx	20	80Mb	£1879
SHARP				
6621	286	12	20Mb	£739
6641	286	12	40Mb	£849
6621	386sx	20	20Mb	£1115
6641	386sx	20	40Mb	£1615
6661	386sx	20	60Mb	£1769
TANDON				
NB386sx-40	386sx	20	40Mb	£1347
NB386sx-60	386sx	20	80Mb	£1487
TOSHIBA				
TL1000LE	8086	10	20Mb	£759
T2000-20	286	12	20Mb	£1025
T2000-40	286	12	40Mb	£1136
T2000sx-20	386sx	16	20Mb	£1309
T2000sx-40	386sx	16	40Mb	£1425
T2000sx-60	386sx	20	60Mb	£1838
T2400sx-60	386sx	20	60Mb	£2209
T3100sx-80	486sx	25	80Mb	£2874
T3100sx-40	386sx	16	40Mb	£1368
T3100sx-60	386sx	16	60Mb	£1457
T3200sx-40	386sx	16	40Mb	£1365
T3200sx-120	386sx	16	120Mb	£1809
T3200sx-120 Col.	386sx	20	120Mb	£1809
T5200-100	386	20	100Mb	£1999
T5200-200	386	20	200Mb	£2209
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TM2000-20	286	12	—	£719
TM3000-20	386sx	20	20Mb	£1419
TM3000-40	386sx	20	40Mb	£1599
TM3000-60	386sx	20	60Mb	£1759
TM3000-80	386sx	20	80Mb	£1999
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Model	CPU	MHz	H/Disk	VGA Mono	VGA Colour	Super VGA Colour
286	286	12	40Mb	£799	£919	£949
386	386sx	16	40Mb	£829	£969	£989
386	386sx	16	110Mb	£869	£989	£999
MCS Range						
286/16	286	16	—	£779	£919	£919
386sx/20	386sx	20	—	£919	£1039	£1039
386/20C	386sx	20	—	£1009	£1139	£1139
486/20	486sx	20	—	£1099	£1239	£1239
486/33	486	33	—	£1459	£1599	£1599
MCS Pro Range						
386/33C	386	33	—	£1369	£1509	£1509
486/33	486	33	—	£1729	£1869	£1869

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486/20	486sx	20	—	£1219	£1359	£1359
486/33	486	33	—	£1589	£1729	£1729

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386/33T	386	33	200Mb	£2269	£2359	£2399
386/33T	386	33	300Mb	£2669	£2799	£2849
386/33T	386	33	600Mb	£3159	£3249	£3299

486/33 Tower Range	CPU	MHz	H/Disk	£3389	£3519	£3569
486/33T	486	33	100Mb	£3389	£3519	£3569
486/33T	486	33	200Mb	£3569	£3699	£3749
486/33T	486	33	300Mb	£3999	£4039	£4189
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				Mono	Mono	Colour	Hi-Res	Colour
5086	8086	8	40Mb	£339	£339	£423	£506	£506
5286	286	16	40Mb	£464	£464	£547	£629	£629
4386	386sx	20	80Mb	£844	£844	£928	£1009	£1009
					Mono	Colour	14" Hi-Res	Col. VGA
3286	286	16	40Mb		£464	£549		£629
3386	386sx	16	40Mb		£636	£719		£799
3386	386sx	16	80Mb		£845	£928		£1009
5086 Includes Microsoft Works V2				3286 Includes Lotus 123 V2.2				
5286 Includes Lotus 123 V2.2				3386 Includes Microsoft Windows 3 & Mouse				
4386 Includes Microsoft Windows 3								

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Model	CPU	MHz	H/Disk	VGA Mono	VGA Colour
PCS286	286	16	40Mb	£709	£789
PCS286	286	16	80Mb	£869	£949
PCS286	286	16	120Mb	£1039	£1109
PCS386	386sx	16	40Mb	£929	£999
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HP LASERJET IIP		4PPM	£709
HP LASERJET III		8PPM	£1039
HP LASERJET IIDD	DUAL BIN/DUPLEX	8PPM	£1599
HP LASERJET III S'		16PPM	£2569
IBM 4019E XL		5PPM	£749
IBM 4019E		10PPM	£979
IBM 4029-020		6PPM	£919
IBM 4029-030		10PPM	£1115
IBM 4029-040	Dual Bin	10PPM	£1259
KYOCERA F800T		8PPM	£939
KYOCERA F820	DUAL BIN	8PPM	£1355
OKLASER 400	0.5Mb	4PPM	£495
OKLASER 830	POSTSCRIPT	8PPM	£949
PANASONIC KXP4420		8PPM	£639
PANASONIC KXP4450i	DUAL BIN	11PPM	£949
QMS PS 410 POSTSCRIPT		4PPM	£1379
STAR LPB-III		8PPM	£929

MODEMS

INTERNAL			
AMSTRAD			
MC2400 V22BIS			
DATAFLEX			
Stradcom V21/V22	£109	Quattro 2422D V22BIS	£412
Biscom V22BIS	£149	Synco 96 V22BIS	£646
Quadcom V22BIS MNP5	£208	Trailblazer 18K V22BIS MNP3	£659
Comfax V22BIS MNP5	£224	Trailblazer V32 V22BIS MNP5	£999
PC Professional V22BIS MNP5	£321	HAYES	
Rapier V22BIS MNP5	£392	Smart 1200 V21/22/23	£233
Rapier Enhanced V22BIS MNP5	£459	Smart 2400 V22BIS	£259
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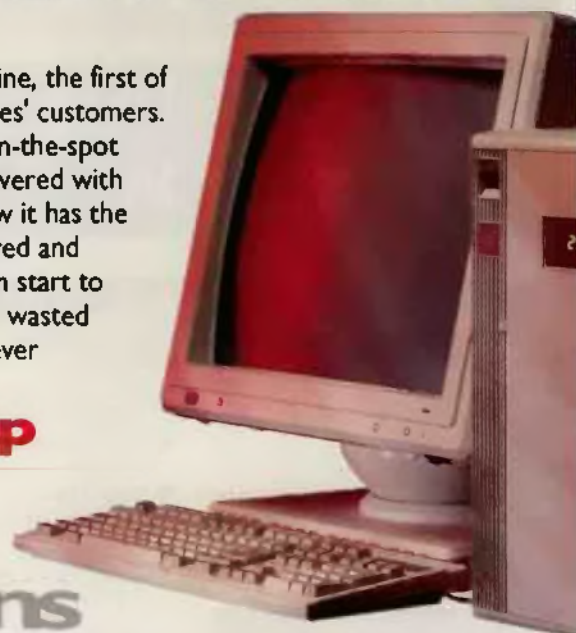
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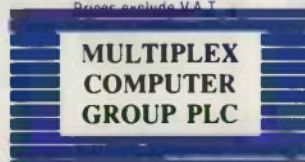
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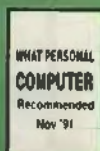
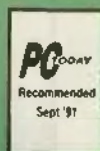
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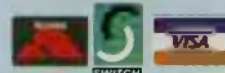


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ST138N-1	SCSI	32Mb	28ms	150
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ST177N	SCSI	60Mb	24ms	209
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PS/2-425T

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- * 200 Watt power supply
- * Fully LIM 4.0 Compatible
- * IDE Hard Disc Controller
- * Small Footprint Metal Case
- * Landmark 140.3Mhz

MONITOR	NONE	HERC MONO	MONO VGA	14" SVGA	17" SVGA
NO HDD	£695	£775	£825	£949	£1629
44MB	£815	£889	£939	£1065	£1735
89MB	£889	£969	£1019	£1145	£1825
124MB	£945	£1025	£1075	£1199	£1875
211MB	£1109	£1189	£1235	£1365	£2045
337MB	£1559	£1665	£1689	£1799	£2499

HOT FOR 92

HOT FOR 92

FALCON II 486DX/C256-33Mhz

FROM
£825.00
PLUS VAT

- * 33Mhz 80486DX Main Board
- * 256K On Board Cache
- * 4Mb Ram Expandable to 32Mb
- * 3.5inch 720K/1.4Mb Disc Drive
- * 2 Serial, 1 Parallel & 1 Game ports
- * Full 102 UK Keyboard
- * 200 Watt power supply
- * Fully LIM 4.0 Compatible
- * IDE Hard Disc Controller
- * Small Footprint Metal Case
- * Landmark 151.9Mhz

MONITOR	NONE	HERC MONO	MONO VGA	14" SVGA	17" SVGA
NO HDD	£825	£905	£955	£1079	£1759
44MB	£945	£1019	£1069	£1195	£1865
89MB	£1019	£1099	£1149	£1275	£1955
124MB	£1075	£1155	£1205	£1329	£1999
211MB	£1239	£1319	£1365	£1495	£2175
337MB	£1689	£1795	£1819	£1929	£2629

EAGLE II 486DX/C512-33Mhz

FROM
£1375.00
PLUS VAT

- * 33Mhz 80486DX Main Board
- * 512K On Board Cache
- * 16Mb Ram Expandable to 32Mb
- * 3.5inch 720K/1.4Mb Disc Drive
- * 2 Serial, 1 Parallel & 1 Game ports
- * Full 102 UK Keyboard
- * 200 Watt power supply
- * Fully LIM 4.0 Compatible
- * IDE Hard Disc Controller
- * Small Footprint Metal Case
- * Landmark 170.6Mhz

MONITOR	NONE	HERC MONO	MONO VGA	14" SVGA	17" SVGA
NO HDD	£1375	£1455	£1505	£1629	£2309
44MB	£1495	£1569	£1619	£1745	£2415
89MB	£1569	£1649	£1699	£1825	£2505
124MB	£1625	£1705	£1755	£1879	£2555
211MB	£1789	£1869	£1915	£2045	£2725
337MB	£2239	£2345	£2369	£2479	£3179

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MICRO SURGEONS

Credit card line 0244 281230

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DOVE II 286-16Mhz STARTER PACK



Mono Herc
£499.00

Colour SVGA
£649.00

PLUS VAT

- * 16Mhz 80286 Main Board
- * 1Mb Ram Expandable to 4Mb
- * 3.5" 720K/1.4Mb Disc Drive
- * 2 Serial 1 Parallel & 1 Game ports
- * Full 102 UK Keyboard
- * 200 Watt power supply
- * Fully LIM 4.0 Compatible
- * IDE Hard Disc Controller
- * Small Footprint Metal Case
- * Landmark 21.0Mhz
- * Hercules Mono/Graphics Monitor
- * Colour Super VGA Monitor (Option)
- * 44Mb Seagate Hard Disc Drive
- * 80 Col. LQ Dot Matrix Printer
- * Parallel Printer Lead
- * MS/Dos 5.0 Software

(All prices shown exclude VAT and Delivery.)

The DOVE Starter Pack was the first in a series of "MICRO SOLUTIONS" to be advertised and it's massive success has given rise to the others shown here. The Starter Pack offers the best value computer package for the first time user. Whether you are writing a letter or using a spreadsheet it's letter quality printer and 44Mb hard disc allows you to do it all.

NETWORK WORKSTATIONS

FROM
£445.00
PLUS VAT



- * Robin 286-16Mhz Lan Workstation
- * Stork 386SX-25Mhz Lan Workstation
- * Heron 386DX-33Mhz Lan Workstation
- * Kestrel 486DX-33Mhz Lan Workstation

- All fitted with:-
- * 1Mb Main Ram
 - * 16 Bit 300-Mbit Lan Card
 - * 2 Serial 1 Parallel port
 - * Full 102 Keyboard
 - * Optional 3.5"/5.25" Disc Drive
 - * Low profile Case

MONITOR:-	NONE	HERC MONO	MONO VGA	14" SVGA	17" SVGA
ROBIN 286-16	£445	£525	£575	£699	£1379
STORK 386SX-25	£565	£639	£699	£815	£1485
HERON 386DX-33	£639	£719	£769	£895	£1575
KESTRAL 486DX-33-C64	£695	£775	£825	£949	£1625

Working from standard DOS you can now share data, Hard disc drives and printers with one of our workstations, by installing our LAN card kit into your own PC. Simple telephone style cables (supplied) allow connection of each workstation to the host PC. Workstations can be discless or have an optional disc drive. Please phone or write for more details.

NAME:-

ADDRESS:-

PRODUCT OF INTEREST

POSTCODE

0244 281025 (5 Lines)

SWIFT II 386SX-25Mhz SUPER SAVER

HOT FOR 92



Mono VGA
£799.00
Colour SVGA
£949.00

PLUS VAT

- * 25Mhz 80386SX Main Board
- * Super VGA 1Mb graphics card
- * 2Mb Ram Expandable to 8Mb
- * 3.5" 720K/1.4Mb Disc Drive
- * 2 serial 1 Parallel & 1 Game ports
- * Full 102 UK Keyboard
- * 200 Watt power supply
- * Fully LIM 4.0 Compatible
- * IDE Hard Disc Controller
- * Small Footprint Metal Case
- * Landmark 33.1Mhz
- * 14" Mono VGA Monitor
- * Colour Super VGA Monitor (option)
- * 44Mb Seagate Hard Disc Drive
- * Cannon BJ10ex Bubble Jet Printer
- * Parallel Printer Cable
- * MS/DOS 5.0 Software
- * Windows 3 Software
- * MS-Compatable Mouse

(All prices shown exclude VAT and Delivery)

The SWIFT 2 Super Saver's powerful 25Mhz-386SX CPU with 2Mb main memory allows Windows based applications room to run at usable speeds. The package includes all you need for running the Windows operating system, e.g. Mouse, Hard disc and Large Screen memory. With the added bonus of printing out with the high quality Cannon bubble Jet printer. Whether you are a business or a home based user this package is a good all rounder.

FALCON II 486DX/33Mhz SUPER SAVER

Mono VGA

£1199

Colour SVGA

£1349

17" SVGA

£1649

HOT FOR 92



- * 33Mhz 80486DX Main Board
- * 256K On Board Cache
- * 4Mb Ram Expandable to 32Mb
- * 3.5" 720K/1.4Mb Disc drive
- * 2 Serial 1 Parallel & 1 Game ports
- * Full 102 UK Keyboard
- * 200 Watt power supply
- * Fully LIM 4.0 Compatible
- * IDE hard Disc Controller
- * Small Tower Metal Case
- * Landmark 151.9Mhz
- * Hercules Mono VGA Monitor
- * Colour Super VGA Monitor (option)
- * 44Mb Seagate hard disc drive
- * Cannon BJ10ex Bubble Jet Printer
- * Parallel Printer cable
- * MS/Dos 5.0 Software
- * Windows 3 Software
- * MS-Compatable Mouse

(All prices shown exclude VAT and Delivery)

Offering you yet more "Micro Solutions" the FALCON II SUPER SAVER gives you powerful software and hardware in a useful value packed combination. Designed for the power user running complex drawing programs with ample spare capacity to print out your daily work load. Complete with the Windows operating system the 486 CPU with built in maths co-processor will make small work of all your Windows based applications.



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MICRO SOLUTIONS

RSC

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Amstrad

WITH FREE ON-SITE MAINTENANCE

PC3086 8MHz 8086 5.25"/3.5" FDD
Mono Colour HRCB
30Mb HD £325 £400 £479

PC3286 16MHz 286 with Free
Lotus 1-2-3 V2.2

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5.25" SD £395 £469 £545
3.5" +HD40 £439 £519 £599
Dual+HD40 £479 £559 £635

PC3386sx, 20MHz 80386SX with
Free windows 3 and mouse.

Mono Colour HRCB
40Mb HD £599 £679 £759
80Mb HD £799 £879 £949
Upgrade to 4Mb RAM £132

PC4386sx 20MHz 80386sx
Mono HRCB
80Mb HD £799 £949

PC5086 8MHz 8086 with
Free MicroSoft Works.

Mono Colour HRCB
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DD £269 £345 £425
HD40 £325 £400 £479

PC5286 16MHz 80286
Mono Colour HRCB
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HD40 £439 £519 £599

PC5286 Games Pack
16MHz 286 40Mb HD £559.00

Olivetti

WITH FREE ON-SITE MAINTENANCE

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Mono HRCB
20Mb HD £659 £699
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Mono HRCB

DD £815 £855
20Mb HD £969 £1009
40Mb HD £1050 £1089
100Mb HD £1285 £1325
Upgrade to 2Mb RAM £64

IBM

WITH FREE ON-SITE MAINTENANCE

PS/2 Bundles

	12" Clr	14" Clr
55-X31	£1299	£1369
55-X61	£1569	£1629
55-041	£1499	£1569
55-081	£1699	£1759
55-161	£2049	£2119

PS/2 Base Units Only

65sx061	£1559	90AK9	£5889
65sx121	£1759	90AKD	£6669
65sx131	£3389	90AG5	£3359
70-121	£1999	90AG9	£3979
70-R21	£3429	95AJ9	£5549
70-A21	£2379	95AJD	£6339
70-M61	£1699	95AK9	£6189
80-A31	£3679	95AKD	£6979
80-M21	£3269	95AJF	£6669
80-M81	£2169	95AKF	£7309
80-M16	£2529	95-V01	£9519
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Norton Utilities £20

Offering sophisticated tools for data
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LotusWorks £30

With database, spreadsheet with graphics
capabilities, word processor with spell
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A Corporate Filecard is a quick and easy way to add
a hard drive to your computer system. Fitted to a
single expansion slot a Corporate Filecard can be
installed in minutes, providing exactly the same
facilities as a normal hard disk. There are no loose
wires to connect, the filecard is a completely self-
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affect the manufacturer's warranty of your PC. All
Corporate Filecards are assembled, fully tested and
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Hi-Tech at Low Prices

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CC212 286 12MHz, 1Mb RAM, 40Mb Hard
Drive, 3.5" or 5.25" floppy drive, 80287 maths co-
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VGA Colour 40Mb HD £569.00

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VGA Colour
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CC318 386sx 20MHz, 2Mb RAM expandable to
8Mb, 3.5" or 5.25" floppy drive, 80387 maths co-
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1 parallel, 1 serial and 1 mouse port, 3 vacant
expansion slots.

Options	VGA Mono	VGA Colour
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For dual drive machine configurations
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ALL PRICES EXCLUDE VAT

Prices subject to change without notice. E & O E

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UNINTERRUPTED POWER SUPPLY

Protection against Power Failures, Spikes,
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Tower UPS Ideal for File Servers & small PC Networks/LAN's. 600 = 60 mins 1250 = 140mins.	
Tower UPS600 - 600va 50Hz	£385.00
Tower UPS1250 - 1250va 50Hz	£559.00
Slim Wonder	£305.00

PORTABLES AND NOTEBOOKS

AMSTRAD	CPU	MHz	RAM	HD	3.5" FDD	WARRANTY	PRICE
ALT 286	286	16	1Mb	20Mb	1.44Mb	1 Year	£984.00 Free BJ10e
ALT 286	286	16	1Mb	40Mb	1.44Mb	1 Year	£795.00 Free BJ10e
ALT 386sx	SX	16	1Mb	40Mb	1.44Mb	1 Year	£1288.00 Free BJ10e
ALT 386sx	SX	16	2Mb	80Mb	1.44Mb	1 Year	£1039.00 Free BJ10e
ACL-386sx	SX	20	4Mb	120Mb	1.44Mb	1 Year	£3029.00
ANB-386sx	SX	16	1Mb	20Mb	1.44Mb	1 Year	£899.00
ANB-386	SX	20	2Mb	40Mb	1.44Mb	1 Year	£1129.00
OLIVETTI							
V16 Notebook	286	16	2Mb	40Mb	1.44Mb	1 Year	£1519.00
S20 Notebook	SX	20	2Mb	60Mb	1.44Mb	1 Year	£1785.00
S20 Laptop	SX	20	2Mb	40Mb	1.44Mb	1 Year	£1965.00
D33 Laptop	386DX	33	4Mb	40Mb	1.44Mb	1 Year	£2399.00
D33 Laptop	386DX	33	4Mb	60Mb	1.44Mb	1 Year	£2679.00
CORPORATE							
G5620NB	SX	20	2Mb	40Mb	1.44Mb	1 Year	£1299.00 with VGA Monitor £1499.00

PERSONAL COMPUTER FAMILY TERMINAL £899



The serious games machine that is also a
serious PC.

Ideal for homework, home accounting or playing the
very latest exciting computer games.

PC-FT 386sx HARDWARE

Mini Tower with 16MHz CPU, 1Mb RAM, 40Mb Hard
Drive, Revolutionary new 3.5" & 5.25" combined floppy
drive, 14" SVGA Colour Monitor, MS-DOS 5.0, Naksha
Serial Mouse with Deluxe Paint II-PC, Teqnich Keyboard
with built-in calculator, Teqnich Joystick, Adlib Sound
Synthesizer card & Stereo Speakers.

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CORPORATE POCKET LAN ADAPTOR

Plugs directly into standard parallel
printer port which enables user to log
onto a network, compatible with
Novell. Full 10Mb/sec operation.
On board 8K data buffer. No
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NAKSHA

Naksha Serial/A Mouse

IBM PC/XT/AT and other IBM compatibles. 420dpi resolution. Complete with Deluxe Point II PC, Mouse driver and warranty.

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Naksha PS/2 Mouse

IBM PS/2 and compatibles. 420dpi resolution. Complete with mouse mat, mouse holder, user guide and Deluxe Point II PC

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Naksha BUS Mouse

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Naksha Series 3 Mouse

Amstrad PC compatible. 280 dpi resolution. Includes mouse mat, mouse holder, disk pack, user guide and Battle of Britain software

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Naksha Upgrade Mouse

Atari ST and Commodore Amiga compatible. 280dpi, connects direct to mouse port. Includes mouse mat, mouse holder, Operation Stealth Software, Electronic Arts Discount Voucher

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Naksha Series C Mouse

Compatible with Commodore PC10/20/30/40. 280dpi. Includes mouse mat, holder, disk pack, user guide and Battle of Britain software

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With FREE On-Site Maintenance

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EPOA

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NEC Silentwriter2 S60

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NEC Silentwriter2 S60P

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NEW Sharp JX-9500H Desk top, 300dpi, 9ppm, 512k RAM expandable to 4.5Mb, an impressive printer at an impressive price.

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Only £25 when bought with any printer.

Facelift comes with 13 typefaces and gives you high quality fonts in every size, including matching screen fonts for Windows applications. (RRP £89.00)



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The essential addition to any PC system. An unbelievable package at an amazing price.

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The Industry standard AdLib

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ALL FOR JUST £99

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Epson LQ450 24 PIN

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Epson LQ1010 24 PIN 132 COL 60 CPS 8k Buffer

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Epson LQ1070 24 PIN

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Epson FX1050 9 PIN 132 COL 264 CPS 54 LQ

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Epson LQ870 24 PIN

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Epson LQ860 (COL) 80 COL 290 CPS 88 LQ

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Panasonic KX-P1124 24 PIN, 80 COL, 240 CPS

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Panasonic KX-P1654 24 PIN, 136 COL, 300 CPS

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Citizen SWIFT 9 + 9 PIN, 80 COL, 192 CPS

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Citizen SWIFT 9X + as above with 136 column

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Citizen SWIFT 24 + 24 PIN, 80 COL

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Olivetti DM124 24-pin, 200cps draft, 50cps NLQ

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Olivetti DM124C 200cps output in draft, 50cps LQ

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Stor LC15 9 PIN 132 COL 150 CPS 37 NLQ

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Stor LC24-15 24 PIN 132 COL 167 CPS 66 NLQ

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Stor XB24-200 24 PIN 80 COL

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Stor XB24-250 24 PIN 80 COL

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Stor LC24-200 24 PIN 222 CPS 67 NLQ

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Stor LC24-200 COLOUR

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Stor LG-200 9 PIN 80 COL 180 CPS 45 NLQ

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Stor ZA200

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Stor ZA250

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NEC P20 24 pin, 80 col, 72 cps LQ, 108 cps HS LQ

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NEC P30 24 pin, 136 col, 72 cps LQ, 108 cps HS LQ

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NEC P60 24 pin, 80 col, 100 cps LQ, 250 cps HS LQ

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NEC P70 Same spec. as P60 but 130 columns

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NEC P90 24 pin, 136 col, 133 cps LQ, 200 cps HS LQ

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EPSON SQ2550

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DICONIX 150

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DICONIX 150 INK CARTRIDGE

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CANON BJ300

£359.00

CANON BJ330

£419.00

CANON BJ300/330

£9.00

Ink Cartridge

£299.00

HP DESKJET 500

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HP DESKJET 500c

£479.00

colour printer

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Olivetti JP350 Hewlett Packard

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Deskjet+ workalike, large capacity

£11.00

150 sheet tray, 2nd bin feed

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option, tractor feed option, times

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roman font on card, 1 year on-site

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buffer

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Black Ink Cartridge

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2nd Bin Sheetfeed

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Serial Interface

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CITIZEN PRO JET Laser quality

output for the cost of a dot matrix

printer. 300 x 300dpi resolution

with automatic sheet feeder

(optional Tractor Feeder)

Only £335.00

COLOUR INKJET

NEW 'DICONIX' 180si £219.00

KODAK 'DICONIX' 330C 64k

RAM, prints on transparencies for

overhead presentations, built-in 50 page

sheet feeder. 150CPS draft, 75CPS

NLQ and 34CPS LQ.

HP PAINTJET XL

£1159.00

HP PAINTJET 30 Colours 90 DPI 167

NLQ

£615.00

Colour Ink Cartridge

£30.00

Black Ink Cartridge

£24.00



Stop! look at these prices

DSi Systems with 44 Mb hard disk	Mono amber monitor	Mono VGA monitor	Super VGA 1024/768
DSi 286-12	£369	£414	£588
DSi 286-16	£399	£444	£618
DSi 286-20	£425	£470	£644
DSi 386-SX-16	£449	£494	£668
DSi 386-SX-25	£499	£544	£718
DSi 386 - 25 64K cache	£615	£665	£829
DS 386 - 33 64K cache	£649	£694	£868
DSi 386 - 40 64K cache	£699	£744	£918
DSi 486 - 33 64k cache	£999	£1044	£1199



All Systems include

- Small footprint case with optional upgrade
- 200 Watt power supply
- 102 key UK keyboard
- 1 Mb fast RAM
- 1.2 or 1.44 Mb disk drive
- IDE controller 1 1 interleave
- 2 Serial and 1 Parallel port
- 1 year back to base warranty
- optional on site warranty
- 110 Mb drive add £120

Peripherals

AT/XT floppy disk controller all formats to 1.44 Mb	£15
IDE hard/floppy controller 1:1 2S 1P	£15
IDE cache controller inc 1 Meg RAM cache	£249
2 Serial/1 parallel I/O card	£13
Mono graphics video card/ LPT1 parallel port	£13
VGA card 256K 8 bit	£29
VGA card 256K 16 bit	£33
Super VGA card 512K 16 bit	£39
Super VGA card Trident 1Mb 16 bit	£65
Super VGA card Tseng Lab 1Mb 16 bit	£95
Mono amber monitor	£45
Super VGA colour 1024x768 resolution	£219
102-keyboard UK click action switchable for XT/AT	£29
5.25" 1.2Mb floppy drive	£44
3.5" 1.44Mb floppy drive	£39
44Mb Seagate ST157A IDE	£119
110Mb Rodine 64Kb cache IDE	£229
Axelen Mouse	£15

Other items available please phone with requirements

Motherboards

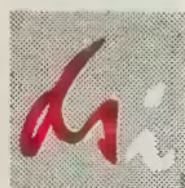
286-12 MHz	0Kb / +1Meg	£49 / £79
286-16 MHz	0Kb / +1Meg	£59 / £89
286-20 MHz	0Kb / +1Meg	£69 / £99
386-SX-16 MHz	0Kb / +1Meg	£119 / £139
386-SX-25 MHz	0Kb / +1Meg	£139 / £179
386 -25 MHz 0K cache	0Kb	£219
386 - 25 MHz 64K cache	0Kb	£259
386 - 33 MHz 64K cache	0Kb	£279
386 - 40 MHz 64K cache	0Kb	£299
486 - 33 MHz 64K cache	0Kb	£499

Supreme VGA card
1 Meg 32000 colours
as reviewed in PC
Buyer, Oct 91

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						Mono	Col.
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PS/1	286	10	40Mb	3.5"	1Mb	£359	£789
286 Computers complete with Microsoft Works V2, Mouse & DOS							
FAMIPACK	286	10	40Mb	3.5"	1Mb	—	£765
Famipack system includes Audio Card and Joystick, Sierra Stepmate, Cakewalk Apprentice, PC Globe, Famitop, World Class Chess, Collins On-Line, Bushbuck.							
PS/1	386sx	16	40Mb	3.5"	2Mb	—	£869
PS/1	386sx	16	40Mb	3.5"	2Mb	2 lap disk	£949
PS/1	386sx	16	80Mb	3.5"	2Mb	2 lap disk	£1129

386sx Computers complete with Microsoft Works V2, Windows 3, Mouse & Dos

Model	CPU	MHz	Hard Disk	Floppy	RAM	VGA	VGA
						Mono	Col.
30-M41	286	10	45Mb	3.5"	1Mb	£503	£513
35-040	386sx	20	—	3.5"	2Mb	£919	£969
35-043	386sx	20	40Mb	3.5"	2Mb	£989	£1089
40-043	386sx	20	40Mb	3.5"	2Mb	£1059	£1129
40-045	386sx	20	80Mb	3.5"	2Mb	£1229	£1329
55-041	386sx	16	40Mb	3.5"	4Mb	£1399	£1499
55-081	386sx	16	80Mb	3.5"	4Mb	—	£1389
55-161	386sx	16	160Mb	3.5"	4Mb	—	£1569
57-045	386sx	20	80Mb	3.5"	4Mb	—	£1889
57-A49	386sx	20	160Mb	3.5"	8Mb	—	£2039

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						Mono	Col.
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PCS286	286	16	80Mb	3.5"	1Mb	£855	£929
PCS286	286	16	120Mb	3.5"	1Mb	£1015	£1093
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						Mono	Col.
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386	386sx	16	40Mb	3.5"	1Mb	£816	£947
386	386sx	16	110Mb	3.5"	1Mb	£849	£989
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286	286	12	Ethernet	3.5"	1Mb	£699	£849
386	386sx	16	Ethernet	3.5"	1Mb	£749	£889

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Model	CPU	MHz	Hard Disk	Floppy	RAM	VGA	VGA
						Mono	Col.
MCS Range	286	16	—	3.5"	2Mb	£769	£899
286/16	286	16	—	3.5"	2Mb	£899	£1020
386sx/20	386sx	20	—	3.5"	2Mb	£989	£1119
386sx/20C	386sx	20	—	3.5"	2Mb	£1084	£1216
486/20	486	20	—	3.5"	2Mb	£1435	£1567
486/33	486	33	—	3.5"	2Mb	—	—
MCS Pro Range							
386/33C	386	33	—	3.5"	4Mb	£1348	£1479
486/33	486	33	—	3.5"	4Mb	£1699	£1829

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3.5"	£75

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386/20C	386sx	20	—	2Mb	£1079	£1209	£1209
486/20	486sx	20	—	2Mb	£1199	£1336	£1336
486/33	486	33	—	2Mb	£1559	£1693	£1693
Data Pad for Pack Range—							
40Mb	£219	100Mb	£328	400Mb	£878	—	—

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386/33 Range	386	33	110Mb	5.25"	1Mb	£1699	£1799
386/33	386	33	200Mb	5.25"	1Mb	£2019	£2159
386/33	386	33	300Mb	5.25"	1Mb	£2299	£2499

386/33 Tower Range

386/33T	386	33	100Mb	Dual	4Mb	£1999	£2137
386/33T	386	33	200Mb	Dual	4Mb	£2225	£2313
386/33T	386	33	300Mb	Dual	4Mb	£2620	£2752
386/33T	386	33	600Mb	Dual	4Mb	£3099	£3190

486/33 Range

486/33	486	33	110Mb	3.5"	4Mb	£3069	£3209
486/33	486	33	200Mb	3.5"	4Mb	£3425	£3559
486/33	486	33	300Mb	3.5"	4Mb	£3649	£3829

486/33 Tower Range

486/33T	486	33	100Mb	Dual	8Mb	£3322	£3454
486/33T	486	33	200Mb	Dual	8Mb	£3498	£3629
486/33T	486	33	300Mb	Dual	8Mb	£3936	£4111
486/33T	486	33	600Mb	Dual	8Mb	£4375	£4507
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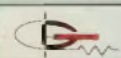
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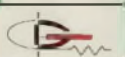
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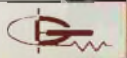
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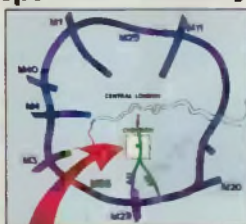
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80386sx	16MHz	8Mb	3x8+5x16BIT	22.5 x 33	-	£145.00
80386sx	20MHz	8Mb	3x8+5x16BIT	22.5 x 33	-	£135.00
80386sx	25MHz	16Mb	1x8+6x16BIT	22.5 x 33	-	£169.00
80386	25MHz	8Mb	2x8+5x16+1x32BIT	22.5 x 33	-	£265.00
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80387-33 (386DX)	£129.00
80487-SX-25	£319.00
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286-2C87/12MHz	£48.00
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40Mb	MFM	251-1	28ms	5.25"/H	£152.00
65Mb	RLL	277R	28ms	5.25"/H	£169.00
84Mb	SCSI	1096N	24ms	3.5"/H	£233.00
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183Mb	SCSI	2209N	18ms	5.25"/H	£545.00
337Mb	SCSI	2383N	15ms	5.25"/H	£729.00
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"TYPE" refers to MFM, RLL, SCSI or AT. H/H = Half Height F/H = Full Height
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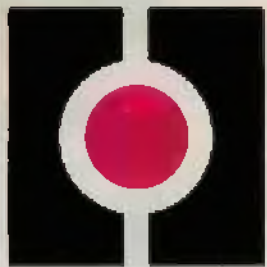
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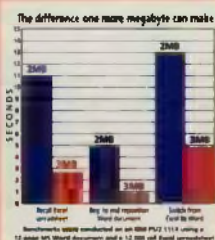
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AD LIB CARD	£69
AD LIB MCA	£Call
AD LIB GOLD	£Call
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SOUNDBLASTER MCA	£195
SOUNDBLASTER PRO	£175
SOUNDBLASTER DEVELOPERS KIT	
MS DOS	£49
MS Windows V.3	£49

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4MB add-on Module	£197
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4MB Expansion Board	£215
DESKPRO 386/16	
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8MB Expansion Board	£815
1MB Expansion Board	£202
4MB Expansion Board	£320
DESKPRO 386S/20	
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SYSTEMPRO, DESKPRO 486/33L, 50L & 486/25	
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32MB Module	£2968
DESKPRO 286	
1.5MB Kit	£69
DESKPRO 286N & 386N	
1MB Module	POWERCUT! £51
2MB Module	£95
4MB Module	POWERCUT! £159
DESKPRO 386A/486, 486/25M, 486S/33M	
64MB Board with 2MB	£215
64MB Board with 4MB	£315
64MB Board with 8MB	£765
PORTABLE III	
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PORTABLE 486M/COLOUR	
2MB Kit	£149
8MB Kit	£467
SLT/286	
1MB Board	POWERCUT! £95
4MB Board	£357
SLT386	
1MB Board	£87
2MB Board	£155
4MB Board	£246
LTE/286	
2MB Board	£114
4MB Board	£235
LTE386S/20	
1MB Board	£117
2MB Board	£200
4MB Board	£310

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PORTABLE 486M/COLOUR

SLT/286

SLT386

LTE/286

LTE386S/20

386L, 486/25, 486L

330MB

660MB

660MB

660MB

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4MB Kit

	£225
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4MB Kit	£239
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80387-25sx (25 MHz)	£94	£89
80387-16 (16 MHz)	£124	£99
80387-20 (20MHz)	£124	£107
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2MB	£95
4MB	£175
PS/2 65SX & 70	
1MB	£55
2MB	£95
4MB	POWERCUT! £169
PS/2 80	
1MB	£65
2MB	£101
4MB	£209
PS/2 90 & 95	
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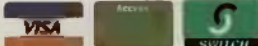
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???????

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2. Name the forerunner to the Apple Macintosh
3. Name the venue of the 3rd PCW Show.
4. How much memory in an original IBM PC?

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PCA SL386SX, SL286-12, SL486	
2MB Kits	£78
PAC Range	£Call
PC 386/20	
4MB Kit	£142
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2MB Kit	£78
4MB Kit	£140
6MB Kit	£198
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2MB Module	£82
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2MB	£125
4MB	£242
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2MB	POWERCUT! £108
4MB	£197
HP LASERJET IIP, IIIP, III, IIID	
2MB	£109
4MB	£199
HP LASERJET IIISi	
4MB	£209
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2MB Board	£149
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2MB	£125
OKI LASER 400/800/820	
1MB	£85
2MB	£125
PANASONIC 4420/4450/4455	
2MB	£139
STAR LP4/LP8	
1MB	£109
2MB	£165
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1MB	£98
2MB	£136
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2MB	£120
4MB	£197
SHARP JX-9500PS	
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8MB Card	£539
T1200XE	
2MB Card	£97
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2MB Card	£97
T2000SX/2200SX	
2MB Card	£175
4MB Card	£285
8MB Card	£612
T3100E	
512K Card	£51
2MB Card	£99
T3100SX	
2MB Card	£97
4MB Card	POWERCUT! £199
T3200SX/C	
2MB Module	£109
4MB Module	£207
T3200	
3MB Card	POWERCUT! £157
T4400	
2MB Card	£217
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4MB Kit	£182
6MB Kit	£234
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2MB Kit	£114
8MB Kit	£442
16MB Kit	£860
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4MB Kit	£179
8MB Kit	£341
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512K Card	£185
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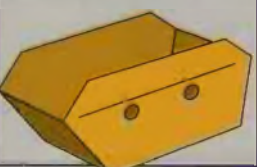
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1MB - 5MB	£196
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4MB Kit	£246
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 16MB BdW/4MB £379
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 & SYSTEMPRO: 32MB Module £922
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 D'PRO 386/20 1MB Module £62
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 D'PRO 386/20e: 1MB Module £62
 & 386S 4MB Module £189
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 4MB Upgrade £337
 1MB Module £53
 2MB Module £90
 4MB Module £169
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 PORTABLE 386: 1MB Upgrade £107
 4MB Upgrade £292
 2MB Board £124
 4MB Board £149
 4MB Board £152
 1MB Board £107
 4MB Board £165
 1MB Board £107
 2MB Board £163
 4MB Board £365

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SLT386:

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2MB Board:

£163

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9 Pages per minute. 512k RAM. Expandable to 4Mb. Laserjet II Emulation. Parallel interface. 250 Sheet input tray. 8 Resident fonts. One year on-site maintenance.

£719

MicroLaser PS17 Plus

Adobe Postscript. 1.5Mb RAM. 17 Resident fonts. Other features as MicroLaser.

£1099

MicroLaser PS35 Plus

Adobe Postscript. 1.5Mb RAM. 35 Resident fonts. Other features as MicroLaser.

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Serial interface	£29	Auto Envelope feeder	£227
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CANON

LBP-4+ 4 Pages per minute. 512K RAM. 50 Sheet paper tray. Bitmap and Scalable fonts. Parallel/Serial and Video interfaces. 16 Character LCD display. One year on-site maintenance.

£588

LBP-8 III+ 8 Pages per minute. 1.5Mb RAM. 200 Sheet paper tray. 14 Resident fonts. Parallel/Serial interface. One year on-site maintenance.

£975

HEWLETT PACKARD

LaserJet IIIP

4 Pages per minute. 1Mb RAM. 70 Sheet multi-purpose input tray. 8 Scalable typefaces and 14 bitmapped fonts. Parallel and Serial interfaces. HP PCL5 printer language. 1 year on-site maintenance.

£699

LaserJet IIIP Apple Mac

£1129

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8 Pages per minute. 1Mb RAM. Two sided (Duplex) printing. Two 200 sheet paper trays. 24 Resident fonts. 1 year on-site maintenance.

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LaserJet IIID Apple Mac

£2399

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HCF-1000 1000 Sheetfeeder	£99

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£2535

LaserJet IIISI Apple Mac

£3549

LASERJET III & IIID ACCESSORIES

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3COM3 + Open/Tokent Ring	£569
International collection font cartridge	£198
Tax 1 Font cartridge	£119

LaserJet III

8 Pages per minute. 1Mb RAM. 8 internal scalable fonts. 14 Built-in bitmapped fonts. HP PCL5 Printer language. HP-GL/2 Vector graphics. Parallel/Serial and extended interfaces. 1 year on-site maintenance.

£1025

LaserJet III Apple Mac

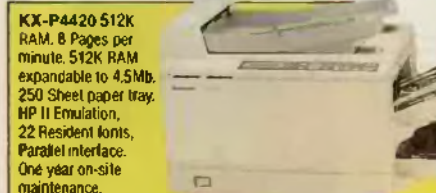
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WordPerfect font cartridge	£119
Jetfont 425 in 1 Font cartridge	£219
Jetfont Superscript International	£131
Pacific headlines cartridge	£149
Pacific page XL	£579
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200 Sheet A4 paper tray **£29**

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200 Sheet input tray. IBM/HP LJII/HPGL and
HP 7475 emulations.
16 Resident fonts. **£729**

500 Sheet A4 paper tray **£45**
200 Sheet legal size paper tray **£33**
200 Sheet A5 paper tray **£33**
Envelope Feeder **£169**



OKI

Okilaser 400
4 Pages per minute. 512K RAM. 25 Resident fonts.
3 Emulations. 200 Sheet input tray. Parallel or Serial
interfaces. 16 Character LCD display. One year on-site
maintenance. **£489**
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STAR

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8 Pages per minute. 1Mb RAM upgradable to 5Mb.
200 Sheet paper tray. 4 Emulations. 14 Resident
fonts. 8 Scaleable fonts. Parallel/Serial interface.
One year on-site maintenance. **£919**

LP-4
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50 Sheet paper tray. 14 Resident fonts. HP & Epson
emulation. Parallel and Serial interfaces. One year
on-site maintenance. **£576**

LP-4 STARSRIPT
Postscript compatible. 2Mb RAM upgradable to 5Mb.
35 fonts. 50 Sheet input tray. HP & Epson emulation.
Parallel, Serial and AppleTalk interfaces as standard.
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8 Pages per minute. 1Mb RAM. Two 200 Sheet
paper tray. Other features as LP-8. **£1189**

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8 Pages per minute. 1Mb RAM.
Double sided printing. Two 200 sheet paper tray.
Other features as LP-8 II Dual Bin. **£1359**

LP-8 III STARSRIPT
Postscript compatible. 2Mb RAM. 8 Pages per
minute. 5 Emulations. 14 Resident fonts. 8
Scaleable fonts. 35 Postscript fonts
Other features as LP-8 III **£1155**

Fonts from **POA**

NEC

Silentwriter 2 S60P
Adobe Postscript. 2Mb RAM. 6 Pages per minute. 35
fully scalable built-in fonts. High performance
MC-68000 Processor. Parallel, Serial and Apple-
Talk interfaces. One year on-site maintenance. **£1089**

Silentwriter 2 290
Adobe Postscript. 8 Pages per minute. 2Mb RAM. 35
fully scalable fonts built-in. High performance
MC68000 Processor. Parallel/Serial and AppleTalk
interfaces. One year on-site maintenance. **£1395**

Silentwriter LC890XL
Postscript. 8 Pages per minute. 4Mb RAM
expandable to 8Mb. Two 250 Sheet paper bins with
collated output. 3 Emulations. 35 Resident fonts.
Parallel/Serial and AppleTalk Interfaces. Built-in SCSI
interface for optional NEC 20Mb Hard disk.
One year on-site maintenance. **£2339**

Colomate PS/40
Adobe Postscript. 4Mb RAM. 1 Page per minute full
colour print speed. NEC thermal transfer engine. Very
high performance MC68020 Processor. Parallel/
Serial/RS422 and AppleTalk interfaces. 17 scaleable
fonts. Pantone certified colour system. One year
on-site maintenance. **£3589**

Colomate PS/80
Features as PS/40 but with 8Mb RAM and 35
scaleable fonts. **£4179**

Silentwriter options	Colomate PS Options	
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890	(legal per 500)	£26
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Okilaser 800
8 Pages per minute. 512K RAM. 35 Resident fonts.
3 Emulations. 200 Sheet input tray. Parallel and Serial
interfaces. 32 Character LCD display. One year on-site
maintenance. **£869**
512K Single bin **£989**
1.5Mb Single bin **£1079**
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Features as Okilaser 800 but with 2 x 200 Sheet input
tray. One year on-site maintenance. **£1049**
512K Dual bin **£1199**
1.5Mb Dual bin **£1299**
2.5Mb Dual bin **£1499**

Okilaser 840
Postscript. 8 Pages per minute. 2Mb RAM. 35 Adobe
(Laserwriter compatible fonts). 3 Emulations. 200 Sheet
Input tray. Parallel/Serial/AppleTalk/RS422 Interfaces. 32
Character LCD display. One year on-site maintenance.
2Mb Single bin **£1199**
4Mb Single bin **£1489**

Okilaser 840 Dual bin
Features as Okilaser 840 but with 2 x 200 Sheet input tray.
One year on-site maintenance. **£1379**
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Features as Okilaser 840 but with 2 x 200 Sheet input tray.
One year on-site maintenance. **£1379**
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One year on-site maintenance. **£1379**
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QMS

PS410
Postscript. 4 Pages per minute. 2Mb RAM. 45 Adobe Postscript
fonts. HP Laserjet II emulation. 68020 Processor running at
16.67MHz. Simultaneous interface operation receives data from
all three interfaces simultaneously. Parallel/Serial
and AppleTalk interfaces. Emulation sensing
processing. QMS driver for Windows 3. **£1329**

PS810
Postscript. 8 Pages per minute. 2Mb RAM. 35 Adobe postscript
fonts. HP LJ + HP7475A Plotter and Diablo 630
emulations. Serial/Parallel/RS422/AppleTalk
interfaces. **£1999**

PS815
Postscript. 8 Pages per minute. 2Mb RAM.
68020 Processor running 20MHz. 200 Sheet
input tray. Other features as PS410. **£2199**

PS825
Postscript. 8 Pages per minute. 2Mb RAM.
Features as PS815 but with two 200 sheet input
trays. **£2589**

PS1500
Postscript. 15 Pages per minute. 4Mb RAM. 68020 Processor
running at 16.67MHz. 35 Adobe postscript fonts. Two 250 sheet
input trays and a 500 sheet face down output tray with
offset stacking. Parallel/Serial/RS422/AppleTalk
and SCSI interfaces. DMS driver for Windows 3. **£4279**

PS2210
Adobe Postscript. 22 Pages per minute. 4Mb RAM. 39 Adobe
postscript fonts. A3 to A6 Paper sizes supported. HP Laserjet
and HP7475 emulations. SCSI Interface for additional
DMS Hard disk. Parallel/Serial/RS422/AppleTalk
and SCSI interfaces. QMS driver for Windows 3. **£7109**

PS2220
Adobe Postscript. 22 Pages per minute.
4Mb RAM. Features as PS2210 but with two
250 sheet input trays **£9199**

QMS COLOUR PRINTERS

ColorScript 100 Model 10
Colour Adobe Postscript. 4Mb RAM with a SCSI Interface for
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system. **£3999**

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Colour Adobe Postscript. 8Mb RAM. A3/A4
paper supported. Other features as Model 10. **£8599**

Options for PS410
A4/Letter or Legal paper
cassettes **£53**
Gradio HCF1000 1000 **£99**
Lower cassette tray **£69**
Envelope tray **£229**
HP-GL Emulator **£175**
HP Pro fonts

Options for PS810/815/825
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Gradio HCF1000 1000 **£99**
Lower cassette tray **£69**
Envelope tray **£229**
HP-GL Emulator **£175**
HP Pro fonts

TONER

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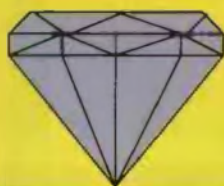
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LC386SX-20	2Mb	16Mb	4	24	Mono Colour	765 885	889 1010	985 1099	1065 1185	1219 1339	1590 1079
LC386-25	2Mb	16Mb	6	34.2	Mono Colour	899 1019	1029 1149	1119 1239	1199 1325	1360 1479	1729 1849
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installation enable you to get the network set up and working.
The network operating system is menu driven thus making it very simple to
operate.

A dedicated file server is not required, thus reducing the cost. Fast 10Mbit/sec
data transfer makes the network as fast as any other for the pcs.

All standard networking applications can be run on the RPTI network. As the RPTI
cards are fully Novell compatible, the network can be upgraded to work with Novell
software without hardware changes, an ideal solution for a low cost start.

RPTI network operations can be enhanced by installing optional software for E-
MAIL to provide office electronic mail system. Remote boot server can provide
facilities to install discless station in the network.

RPTI cards are available for 8 bit, 16 bit and MCA systems and these cards can
be mixed in a network. Networks can be extended by simply installing an
additional card in the new station.

COMPLETE KITS FOR THREE STATION NETWORK

NET3000 8 bit	£349(b)	NET4000 16 bit	£399(b)
Kits include 3 cards, Network Operating System, Manuals & Cables			

NET3000 Card	£115(b)	NET4000 Card	£129(b)	NET3000M MCA Card	£175(b)
Longer cables and other Ethernet accessories available					

Detailed spec sheets available on request

NOVELL/COMPATIBLE CARDS

Novell NE1000 Card 8 bit	£119(c)	8 bit card with Boot ROM skt	£109(b)
Novell NE2000 Card 16 bit	£159(c)	16 bit card with Boot ROM skt	£149(b)
Novell MCA Card 16 bit	£159(c)	MCA card with Boot ROM skt	£159(b)
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AB-11 Ext Tape Port Kit	£25(b)
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700Mb Ext. Drive & Card (AT)	£950(a)

PS/2 Models Available
Software for UNIX/XENIX systems available

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ST11M HD Controller XT	£35(c)
ST21M HD Controller AT	£29(c)
ST22M HD/FD Controller AT	£35(c)
ST01 SCSI HD Adaptor XT/AT	£19(c)
ST02 SCSI HD Adapt/FDC XT/AT	£29(c)
IDE HD Adaptor AT	£19(c)
IDE HD Adap/FDC AT	£29(c)
IDE HD Adap/FDC/	
Multi I/O	£39(c)
WD 1009-SE2 HD/FDC	
ESDI AT	£179(c)
FUTURE DOMAIN Controllers	
TMC 1660 16 bit SCSI 2HD	£179(b)
TMC 1680 16 bit SCSI 2HD/FD	£195(c)
FD Cable: Single	£6(d) Dual £9(d)
HD Cable: Single	£8(d) Dual £12(d)

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Parallel Port Card (2 ports)	£14(d)
XT 1 par/1 Serial Port	£16(d)
XT 1 par/2 Serial Ports	£21(c)
XT 1/2 Serial Ports	£12/£17(c)
AT 1/2 Serial Ports	£14/£19(c)
AT 1 Par/1 Serial Port	£18(c)
AT 1 Par/2 Serial Ports	£23(c)
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XT 150W power supply	£45(a)
Cherry 102 key k/bd (AT/XT)	£52(a)

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720K 3.5 + 5.25 adaptor kit	£37(b)		
1.44Mb 3.5 + 5.25 adaptor kit	£42(b)		
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half height frame. Only one power and one			
i/face cable reqd. Can replace a single			
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system. £109(b)			

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5.25" drive head cleaning kits	£5
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386S	1MB 113633	£95(b)	T2000SX	2MB PA8317	£129(b)	PS/2 55SX 031 061 65SX	4MB 34F2933	£165(b)
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386S	4MB 113634	£205(b)	T2000SX/T1000LE	8MB PA8315	£529(b)	PS/2 80 111 311 121 321	2MB 6450379	£85(b)
386/33 486/25/33L	2MB 115144	£299(b)	T2000SX/T2200SX	2MB PA2000	£179(b)	PS/2 80 A21 A31	4MB 6451060	£199(b)
486/25/33L 386/33L	8MB 116561	£279(b)	T2000SX/T2200SX	4MB PA2001	£279(b)	PS/2 50 50Z 55SX 60	2-14MB 6450609	£249(b)
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DP386N & 386s M20	2MB 118689	£90(b)	T2000SX/T2200SX	2MB PA8308	£90(b)	NOTEBOOK L40SX	4MB 79F1000	£199(b)
DP286/386N & 386s	4MB 118690	£159(b)	T3100SX	4MB PA8310	£169(b)	PS/2 M579X	2MB 6450902	£129(b)
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44256-100	£3.50	1Mb installed	£95(c)	4MB x 9-70ns	£129 -	80387SX-16	£86 £84		
44256-80	£4.00	2Mb installed	£139(b)	256K x 9-80ns	£11 £14	80387-SX20	£94 £89		
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		2Mb installed	£289(a)						
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		F820/1800A/5000	£89	MANN TALLY	Model 904 1Mb £99
BROTHER		QMS		OM	
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MODELS	V22BIS	V32	V42	V42BIS	MNP LEVEL	MAX DTE SPEEDS	Int	Ext
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Courier 2400e Quad V21/23/22	✓					2400	-	£240
Courier HST V21/22	✓	✓		✓	5	2400	£415	£399
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Biscom V21/22	✓					2400	£142	£179
Quadcom V21/22	✓				5	3540	£199	£265
Comfax V21/22 Modem/FAX	✓				5	9600	£225	£272
Rapier V21/22	✓	✓	✓	✓	5	30000	£379	£445
Quadsync V21/23/22	✓				5	9600	£279	£349
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MCA Rapier V21/22	✓	✓	✓	✓	5	30000	£529	-
DOWTY								
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GS-C105+

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Delivers a Universe of Colour with performance comparable to a flatbed scanner.

- 100-400 dpi selectable in steps of 10 dpi
- for 2 and 16 colours, 200 dpi for 256
- iPhoto scanning software and CATOCR
- for text scanning

Minimum system config 286/2Mb RAM/HD VGA

GS-4500

£79(b)

GS-4500 + iPhoto £119(b)

A versatile and economically priced and easy to use scanner.

- 100-400 dpi resolution
- Scan & Merge facility
- ScanEdit II scanning software
- Dr Genius Paint package
- Prodigy OCR + optional iPhoto

iPHOTO SOFTWARE

A powerful colour and grey scale image scanning, enhancement, conversion and printing utility program. It is Windows 3.0 based interactive program, thus making it compatible with all printers driven by Windows and Graphic cards which operate with Windows.

- Supports grey scale image and 2-, 8-, 16-, 256 colour images
- Supports Handles large and high resolution images
- Powerful conversion facilities for different file formats
- Powerful editing functions like cut/paste/cropping/scaling, rotation, colour enhancement etc.

£49

GENIUS DIGITISING TABLETS

A range of tablets for PC/XT/AT/PS2 systems interfacing through the RS232 port. They are fully compatible with most of the popular CAD and paint packages. Ease of their use greatly enhances productivity.

Tablets can also function as mouse. GT1212 & GT1812 are supplied with Utility software, Dr Genius, Genius Menu Maker with library of preconfigured menus and a AutoCAD template. Utility software includes ADI drivers for AutoCAD, AutoShade and AutoSketch and emulators for various tablets like SummaGraphics (MM1201/1812) etc. GT906 includes Utility software and emulates SummaGraphics MM961 tablet. The 1812 also includes CasCAD II CAD software.

Computer Shopper on GT1212B said

"The value for money of this digitiser is amazing".

- All tablets include a UK Std power supply with 13A plug
- GT1812D is similar to GT1812 but includes a LCD display for coordinates

Windows 3.0 driver available

Model	GT1212 B	GT1812 GT1812D	GT906
Working area	12" x 12"	18" x 12"	9" x 6"
Data Rate	150 to 19,200 BAUD		
Sampling Rate	20 to 100 pairs/sec		
Resolution	1000 Lines/inch. Accuracy ± 0.01		
Pointing device	4 button puck	Multi Directional 4 button puck + stylus	3 button stylus
Price	£150(a)	£245/£275(a)	£85(b)

- Options: GT1212:3 button stylus £15/Windows 3.0 driver £15 (GT1812/GT1812D include the above options)

GENIUS MOUSE RANGE (Serial, with full Microsoft compatibility)

GM-M330 £42(b)

Advanced optical mouse offering high accuracy, reliability (no moving parts), ergonomically designed. Includes CasCAD I, 9/25 pin adaptor.

All above 'mouses' include DR Genius paint/slide show software, Genius MenuMaker with library and a mouse mat. F303/302 & GM6000 also include mouse pocket.

GM-W220 £36(b)

Cordless mouse giving you the freedom of movement. Including: 2 NiCAD batteries, charger, PS2, 9/25 pin adaptor.

GM-F303 £33(b)

A ergonomically styled 2/3 button mouse, 350-1050 dpi dynamic resolution, precise X-Y movements includes PS2, 9/25 pin adaptor, CasCAD 1 s/w.

GM-F302 £25(b)

As F303 but without CasCAD I & Ps2 adaptor.

GM6000 £19(b)

Low cost 2/3 button mouse offering high performance

GM-D320 £15(c)

Serial mouse + Driver (25 pin D).

GM-D220P £15(d)

Mouse for PS2s & Notebooks + driver.

GK-T320

£39(b)

A3 button trackball, centre button lock for easy cursor drag. Auto detection for 2/3 button modes. Including Dr Genius, PS/2 and 9/25 pin adaptors.

All Genius Software on 5.25" discs. £5 extra for 3.5" disks

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- 4:1 Auto Switch: Four PCs to share 1 printer. Parallel or serial. £65.(b)
- Auto Cross-Over Switch: Four PCs can share two printers. Software switching. Parallel or Serial £85(b)

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	2m	3m	5m
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Reversible, inexpensive manual data switches

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Please check connector types when ordering.

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(Serial/Parallel)
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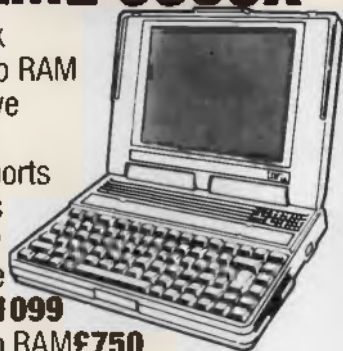
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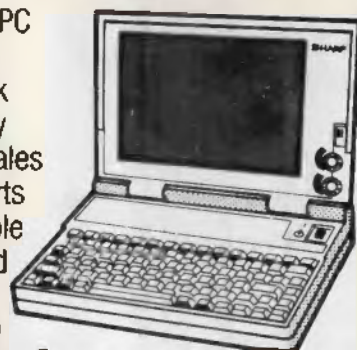


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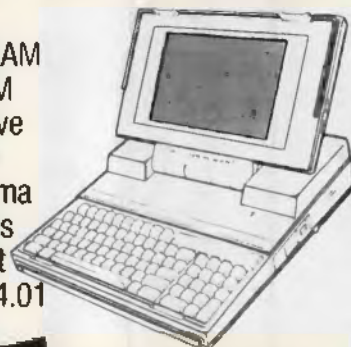


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*HP IIISI	£2515

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Olivetti

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Canon

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*LBP III R	£1445

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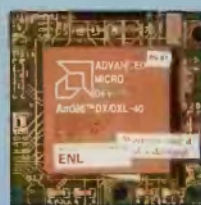
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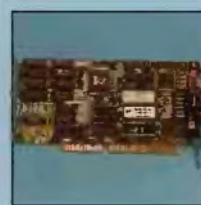
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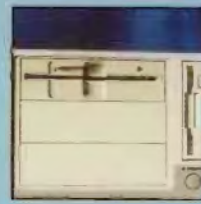
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Intel tries to socket to 'em for extra chip sales

It takes chutzpah to make a selling point of an empty motherboard socket, but Intel has just that. The idea is simple: you buy a PC with the processor you need or can afford now, and add another, faster processor later. Whether this is a brilliant innovation providing users with an easy upgrade path, or a cynical marketing ploy, is a matter of interpretation. Either way, users end up buying two processors per PC instead of one, adding substantially to Intel's growing sales and profits.

Intel describes the upgrade as a 'mid-life kicker' — a phrase used in the IBM mainframe market when new versions of fading machines are launched to halt a decline in sales. But Intel doesn't mean that at all. Rather, it is addressing the problem created by the rate of progress in microprocessor development. A PC's 'life cycle' is typically five years, but 'silicon evolution' takes only two or three years. For half its life, therefore, a PC is out of date.

Note that Intel isn't claiming its mid-life kicker will extend the life of useful PCs beyond about five years, merely that it will 'enrich' (lovely word) their usefulness in old age.

Response to competition

But the upgrade policy is also a response to competition from firms such as Advanced Micro Devices (AMD) and Chips & Technologies, who have circumvented Intel's refusal to 'second source' the 386 processor. AMD's success is evident from its latest financial figures: in the fourth quarter, sales jumped 38% to \$366 million, producing a \$107 million profit against last time's \$43 million loss. It's small beer compared to Intel's \$4.8 billion annual turnover, but nonetheless AMD hopes to take 50% of the 386 market.

Intel is lopping up to a third off 386 prices from 1 April to compete, but it really wants to move buyers from the 386 to the 486. Its first attempt to do this was the 486SX, and its second is a new 'speed doubling' idea.

The 486 was originally presented as the equivalent of three separate chips from the 386 family: the 386 itself, the 387 maths co-processor and the 385 cache controller. No doubt this was a worthy offering. However, to people who wouldn't have bothered to buy a 387 anyway, it was a pricey one.

SX romps

Intel's response was to produce a cheaper, cut-down version of the 486, called the 486SX. The SX ought to have been designated a full chip with a cut-down bus, like the 386SX. At least at first, it was a brain-damaged 486DX, with the maths co-processor disabled. Into the 'upgrade' socket alongside the 486SX, users were invited to insert what was actually a full 486DX chip, which disabled the 486SX.

So far this might just be considered a big-company marketing exercise. However, Intel used the pin configurations in a pretty nasty way. Users

wouldn't complain if they could pluck out a 486SX, trade it in or sell it second hand, and replace it with a 486DX — that would provide an economical upgrade path. However, the 486SX has a different pin-out from the 486DX, so you can't do that. Further, the pin-out of the upgrade socket is not the same as the DX either, so you can't buy a standard 486DX, but have to buy the official 487SX upgrade! Users are thus obliged to buy two Intel processors instead of one.

Solution

In the long term, of course, it can't be a good idea for Intel to sell expensive but brain-damaged DX chips at a fraction of the price just to sustain the SX market. However, it has a solution which will arrive soon in Plastic Quad Flat Pack format. The new 486SX will be a PQFP version of the chip, which contrasts with the standard PGA or Pin Grid Array implementation. This will have the 387 co-processor removed, which means a smaller, cheaper chip. And the flat-pack implementation is designed to be surface-mounted direct to the motherboard, not socketed, so users won't ever have to think about removing it.

Intel's second ploy is clock-doubling technology. A new bus interface is being added to the 486 that will enable it to run at twice the speed. Although the rest of the computer won't be speeded up, Intel says it still makes a suite of business applications run about 50% faster.

Again, the double-speed upgrade chip will fit into a co-processor socket, disabling the original 486. Users will still end up buying two Intel chips, only one of which will be doing any work.

P5 rumours

Of course, the clock-doubling upgrade socket could turn out to have another attraction. Rumours have suggested that this socket will also accept the new Intel 586 processor, codenamed P5, which is due about the middle of this year. This is a 486 re-designed to exploit techniques honed in the production of fast RISC processors. The 586 is supposed to do around 100 mips (million instructions per second), which would make it faster than all today's RISC processors, including the Mips R4000 and the multiple chips used in IBM's RS/6000 range of Unix boxes.

The 586 will enable Intel to stay ahead of AMD, which should have announced its own AMD486 processor by the time you read this. It will probably make an impact in the workstation and minicomputer markets, where RISC has been taking over.

However, it remains to be seen whether 100 mips will be of much use to people using PCs, even if they're running Microsoft Windows. I suspect the processor in my PC already spends most of its time doing nothing very much, except waiting for keypresses. A machine with a 40MHz AMD386, with

▷ extra cash spent on a faster graphics card and faster hard disk, might well be better value.

If all this sounds negative, remember that Intel users have done better than Motorola users, because Intel has driven up clock speeds and driven down prices over the last decade. People who were buying 8MHz Motorola 68000-based micros in 1985 are still being offered largely the same things

today. And when Motorola announced the latest 68LC040 processor in November — strangely, a low-cost (\$185) 68040 with the maths co-processor removed — I didn't notice a public outcry, nor even a flicker of interest. I certainly don't expect to see it advertised on television. While we may be confused or upset by what Intel does, at least it matters.

Jack Schofield

SPEC venture is a sorry case of lies, damned lies and benchmarks

It looks as though IBM has failed to overtake Hewlett-Packard in the race to build fast, cheap Unix workstations, but it has just topped HP at the high end. Well, that's if you believe SPECmarks are any guide.

SPEC stands for the Systems Performance Evaluation Co-operative, although its legal name is the Standard Performance Evaluation Corporation. It's basically a bunch of workstation manufacturers who, in 1989, combined at the behest of America's *Electronic Engineering Times* magazine to agree a set of benchmarks.

Apollo, DEC, Hewlett-Packard and Sun were among the founders, and IBM joined soon after, when the RS/6000 range was at an advanced stage.

The group decided to use normal workstation-type programs to test machines, rather than an artificial test suite. They would surely reflect 'real life', whatever that is. More than 50 programs were proposed, and 10 were democratically selected. Examples included Spice, an analogue circuit emulation, Li, a Lisp program

which solves the 'eight queens' chess problem, and fpppp, a quantum chemistry benchmark. The geometric mean of the results of running the suite of programs produces a single figure, the SPECmark.

IBM did not propose or sponsor any of these routines, but nonetheless, the results were very good news for the company. Most workstations performed in the 10 to 20 SPECmarks range, but IBM's slowest RS/6000 came in at 22.3, and its highest scored 34.7. It looked as though these machines were in a class by themselves.

Actually, of course, the RS/6000's real performance is fairly average running integer C programs. However, it performs brilliantly when running double-precision floating point Fortran, and six of

the 10 SPECmark routines are Fortran. That's great if it's what you want to do, but could be misleading if it isn't.

HP strikes back

One of the few companies not to be intimidated was Hewlett-Packard. Its Precision Architecture (HP-PA) RISC system is a simple chip that exploits high clock speeds and relies heavily on optimising compilers. HP used its compilers to attack the SPEC routines and its Snake range soon displaced IBM as the SPECmark leader.

The 'worst case' is the matrix300 benchmark. An IBM PS/2 Model 90 (with a 33MHz 486) turns in a reasonable score of 12.2 for this. IBM's 30MHz RS/6000 almost doubled this to 22 and a year ago the 42MHz machine took it up to 78.3. HP's Snake started at 36.1 and using Fortran pre-processing (not applicable to real-world stuff), pushed it up to 273 and then 408. Using the same techniques, IBM's latest figure, for the same 42MHz processor, is 730!

No-one pretends that workstations are ten times faster today than they were a year ago. Obviously, unless users have obtained the latest compilers and recompiled their software, they aren't any faster at all. Nor do I see millions of people swapping their Intel 486-based PCs for workstations on the grounds that they're ten times faster: they aren't. All that's resulted from the sincere efforts of a lot of clever people is that SPECmarks have been discredited. For a co-operative that started with such noble aims, that's a shame.

SPEC has dropped matrix300 from its benchmark suite, and it has decided to split the SPECmark. It has demanded separate figures for integer C and floating-point Fortran performance. Both actions will restore some credibility, though I'm not sure how much. In my darker moments I think we might as well go back to mips, since although this stands for 'million instructions per second', everyone knows it could be legally registered as 'meaningless indicator of processor speed'. Meanwhile, if you want to buy a machine to run, say, AutoCAD, then the most reliable test is to measure its performance running AutoCAD. This is tedious and impractical, but there it is.

I should have listened to my mother when she said that, in the computer industry, there were lies, damned lies and benchmarks.

Jack Schofield



▷ Giving the impression of being in a class their own: IBM workstations fared well in SPEC's performance tests, but how reliable are benchmarks?

DEC price cuts challenge Dell

The Digital Equipment Corporation has decided to sell PCs direct in competition with Dell, CompuAdd and similar small suppliers. This has involved 'rationalising' its pricing structure. For example, an entry-level DECpc 316 has come down from £2519 to £1195 — but bear in mind that the 'usual corporate discounts' won't apply.

DEC doesn't actually make PCs. The DECdirect range includes desktop machines from Olivetti, notebooks from Triumph Adler, and file servers from Intel. DEC is offering ready-built, custom-configured and built-to-order systems.

DEC has been selling direct — or at least, taking

orders over the phone — for about 10 years. It has not enjoyed much success in the PC market, though it claims PCs last year accounted for \$1.25 billion of its \$14 billion turnover. It plans a massive advertising campaign to increase that.

Other corporate giants, including IBM, are also expected to offer PCs direct to users this year: firms like Dell are shifting too many boxes for them to ignore this market. DEC has been first off the mark partly because it doesn't have to worry about upsetting hundreds of computer dealers, on whom some of its rivals have spent vast amounts of money.

Jack Schofield

Intel overtakes Motorola in US

Last year Intel sneaked past Motorola to become America's largest chip manufacturer, according to figures from Dataquest. Intel's semiconductor sales are \$4.1 billion, up 28, while Motorola's are \$3.9 billion, up just six.

However, Intel and Motorola fell further behind the top three Japanese suppliers. NEC still leads the way (\$5.5 billion), followed by Toshiba (\$5.3 bil-

lion) and Hitachi (\$4.4 billion).

The top 10 is made up of six Japanese and three American companies — Texas Instruments is the other — with Europe's Philips (\$2.1 billion) lying in last place.

The top 20 firms, including 11 Japanese suppliers, made sales worth almost \$65 billion.

Jack Schofield

Quorum opens Unix to Mac apps

I've just come across something that would really excite me, if I hadn't had my hopes dashed too many times before. Quorum, a small California company, working in secrecy for two years, has just announced a pair of products that promise to make available the wealth of Macintosh applications on a variety of Unix platforms.

The key to all of this is the Quorum Compatibility Engine, a portable Macintosh API implementation that runs on Sun workstations, the RS/6000 and the Silicon Graphics Indigo (though Quorum expects to support all major workstation vendors by the end of the year). It gives a Macintosh application all the services that it requires, but using calls to a workstation's own interface. It maps the Mac's QuickDraw interface to Display PostScript.

Latitude

The first product from Quorum will be Latitude, to be delivered sometime in the first quarter of the year. It will allow Mac software developers to create native Unix applications from their existing code, using their native interface (after a few weeks of tidying up). Unlike a straightforward emulator, this would not involve a substantial speed penalty.

But unless (and until?) a significant number of Mac programs are brought across, workstation users will have to use Quorum Equal — Quorum's second product, due by the end of the second quarter. For under \$1000, it is a 'second generation' emulator. What it will do is emulate a 68000 proc-

essor for straight computation, but pass Apple Toolbox calls to the Compatibility Engine where they are translated to calls to the native Unix. According to Quorum, this can be up to four times faster than conventional software emulation.

What Macintosh software can be translated? Quorum says that all System 7 features will be implemented, except Publish & Subscribe and DAL.

Protection

Even more importantly, what will Apple do about it? I wasn't able to speak to anyone at Apple about this before going to press, but Quorum argues that it isn't duplicating the Mac — everything is mapped to its Unix GUI equivalent — so it isn't liable to get sued. I think the more telling protection for this fledgling is the interest from big companies like Adobe and Aldus (though at this point, nobody I've spoken to except the workstation vendors who stand to benefit is willing to endorse the venture publicly).

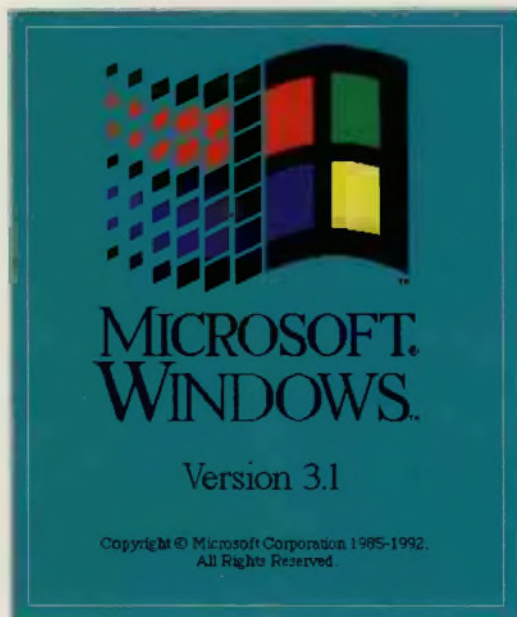
No NeXT market

One sad note: Quorum apparently did all of the early development of the product on NeXT machines, but has no plans to announce a NeXT version of its software — no market for it yet, apparently. Maybe this will change if NeXT's planned 486 port is successful.

Quorum is on 0101-415 323 3111.

David Brake

Windows World poised for 3.1 and revamped Excel



Manager (which helps you to run through 'what-if options) — both similar to 1-2-3 for Windows

April 6 will be a big day for Microsoft and for many of its punters as well. On that day, at the Windows World show in Chicago, it will unveil Windows 3.1 (Windows 3.0 done properly) and Excel 4.0 (Excel with everyone else's good bits put in).

Yes, the features list for Excel 4.0 seems to include a customisable icon bar and a Scenario

functions. The fundamentally different structure of Excel doesn't allow it to be 3D in quite the way that Lotus is. But Excel will be able to group several worksheets (with macros and charts) together into a single file, and formulas will be applied along the resulting Z axis.

Borland's ObjectVision and its forthcoming Quattro Pro for Windows spreadsheet include a feature called the Property Inspector, a short menu for editing objects on screen. Excel 4.0 will have something very similar.

Drag and drop

Original Microsoft features will include the 'drag and drop' editing it pioneered with Word for Windows 2.0. Perhaps the most ambitious feature in Excel, however, will be the planned Lotus 1-2-3 macro interpreter, which should run all macros written for 2.01. I guess we'll just have to wait until April to see if they've got that one right.

David Brake

IBM targets laptop market

IBM is expected to release a series of new portables in an attempt to grab a slice of one of the last PC markets with growth left in it, according to US sources. The first machine, rumoured to be about to launch in the US, will be a low-cost 16MHz 386SX-based notebook whose key distinguishing feature will be that it incorporates MCA. Later in the first quarter, sources in the US claim, there will be an improved version of the existing 20MHz 386SX laptop with an 80Mb drive. Further on, one or two new colour laptops should become available, possibly incorporating IBM's new 20MHz 386SLC chip (an IBM-owned processor with a better cache and improved design which it claims gives up to 88% better performance).

Characteristically, IBM denies the whole thing.

David Brake

squeeze in a 25x80 character CGA display. It uses a 7MHz V20L, similar to an 8086, costs \$1995 in the US, and can work for between 16 and 48 hours on two AA batteries. It weighs just 1.2 pounds and has two PCMCIA 1.0 card slots for storage. As Ron Leigh, Poquet's MD, points out, you should be able

Pen system may redeem Poquet's fortune and fame

We may not have thought much of the Poquet PC in this month's Hardware Group Test (see page 170) but a miniature pen-based machine the company is about to launch may restore its street cred.

While an A4-sized notepad may be required for some applications, others can certainly get by with the Poquet Pad's 7.25in (diagonal) digitiser-screen, which can

hold the Pad with one hand and write on it with the other, something that I've found is distinctly awkward to do with the larger machines, and gives you a pain in the arm after a while.

Of course, with a processor as puny as the Pad's, and 640K of RAM, it isn't going to run the glamorous new pen operating systems from Microsoft or GO. But Poquet will probably be making it available with GRiD's PenRight! operating system as well as MSDOS 3.3, a forms generation package, and handwriting recognition software. Mind you, I wouldn't like to try to get anything with an XT-like processor to try to recognise handwriting (particularly mine).

Unsure about applications

Unfortunately, it won't be shipping as a personal organiser — Poquet reckons the money for something like this is in custom corporate applications. Or if it's being honest, Poquet isn't really sure exactly what people want to do with something like this.

If you have an application and cash to spend, give Poquet a ring and the company will try to work something out for you between now and when the hardware ships (second quarter, apparently).

Poquet is on (0895) 430001.

David Brake

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Mac-look toilet goes on line as Apple aims for GUI royal flush


Modem upgrade

Omnitel Europe has woken up to the latest standards and upped the specification on its 2400S+ modem to include V42bis error correction and data compression, which it claims can speed up data transfer by 300%. The upgraded model costs £299, the same as the old one.

The modem's Digital Signal Processing feature apparently allows the inclusion of the standard at no extra cost. The unit also supports V42, V21, V22, V22bis and V23 standards. Upgrades will be sorted out on application.

Omnitel is on (0734) 814121.

Danny Bradbury

 Apple is making a big thrust into the consumer market with digital organisers and multimedia kits. It also plans Mac-style front ends for up-and-coming digital products such as books, newspapers, telephones, TVs and other appliances.

Even toilets, which the Japanese have already digitised. (When I was last in Japan, I went to flush one and found it lacked the usual handle. Instead, I was greeted by an electronic keypad on the back of the seat. This was marked in Japanese. Without thinking about what I was doing, I pushed a button. Unfortunately, I had pushed the button for the bidet and got soaked.)

Apple will soon introduce a CD ROM-based Mac for both the business and the consumer markets, and is planning handheld organisers called Personal Digital Assistants, company president John Sculley said in a keynote speech at the Winter Consumer Electronics Show in Las Vegas.

Sculley hinted that Apple is looking at wireless ways to link these PDAs to a PC, and is working on multimedia consumer products. He gave no details, but readers of this column will know that Apple and General Magic plan a joint product called the Personal Information Comulti-mediaunicator.

Sculley on strategy

And a few days later Sculley spoke more about Apple's multimedia strategy. He told MacWorld in San Francisco that Apple's newly released Quicktime extensions were at the heart of its desktop multimedia programme. Quicktime technology aims to tie voice, stereo sound, full motion video, and other multimedia products to the desktop and 'provide a time-based solution for multimedia computers'.

Sculley surprised some by revealing that he would license his GUI and the new Mac-based OS to other makers of computer and consumer prod-

ucts. He pointed out that the new OS is designed to access digital information even more easily than is possible with today's Mac.

He also said he would have Apple continue its existing business strategy, but would soon develop a complete separate consumer electronics division.

New direction

Clearly, Apple is heading in a brand new direction. The key to understanding the strategy is the fact that Apple has concluded that its greatest asset is its software; more specifically, its easy-to-use interface. Sculley and Apple's executive team have decided that this software could be the front end to any digital device from a PC to a TV.

Apple will still make hardware products, such as computers and handheld devices, but it realises that these are just a vehicle for getting the software to market. Apple makes good money on hardware, but imagine what it would make if it got a licence fee for every digital TV sold. Or, a fee for every digital videophone that is sold. Any of the hardware providers could provide a digital front end, but the trend will be to have an interface standard to office, home and commercial applications.

This strategy is not necessarily one that is original to Apple. In fact, Microsoft's moves with Windows have caused Apple to focus on it. Bill Gates and Microsoft have stated for some time that their strategy is Windows, Windows and Windows. They have Windows for the PC, Windows for Pen and Windows for Multimedia. They are in the process of talking to phone companies, game makers, and TV broadcasters.

All of this comes down to what is set to be one of the biggest fights of the decade. I expect Apple and Microsoft to go head to head for control of all of these digital devices that will be pervasive throughout many industries in the future.

Tim Bajarin

Unix joint venture for small boxes

Want to run Unix but haven't got gobs of RAM, hard disk and processing power? Novell knows how you feel, and is teaming up with Unix System Laboratories to form a joint venture called Univel with \$30 million. Its task in life is to bring System V Release 4.1 to the masses through an easy-to-install, inexpensive and heavily-marketed version. Unsurprisingly, it will also have the task of tying Netware and Unix closer together. No matter how cheap it is, however, it will have some way to go before it matches Coherent.

A new distributor reminded us of the existence of Coherent, which can make even a lowly 286 (with 640K of RAM and 7Mb free on the hard disk) into a Unix machine for just £99. Of course, you

won't be running any off-the-shelf software on it, but it comes with a C compiler. It is a kind-of clone of System V, but with a little over 200 of the most popular commands available, no support for TCP/IP networking, and no flashy graphics, it's just a command-line interface.

The primary purpose of this product is training, since programs can only run in 64K. It also enables you to make your friends green with envy when you tell them that you're running Unix on your home machine.

MarketMasters International on 091-427 6430 is the new company handling Coherent, and good luck to them!

David Brake

RE: MAJOR UK OVERSTOCK OF IBM COMPATIBLE PC'S AND "FAMOUS NAME" PRINTERS

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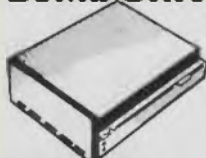
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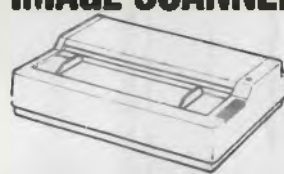
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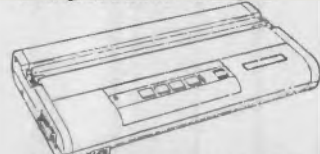
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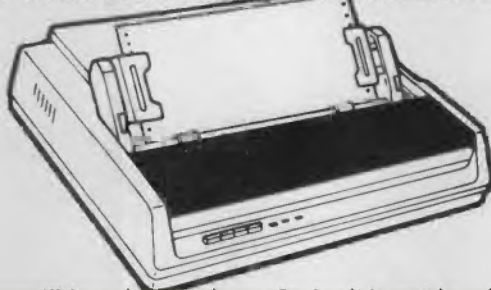
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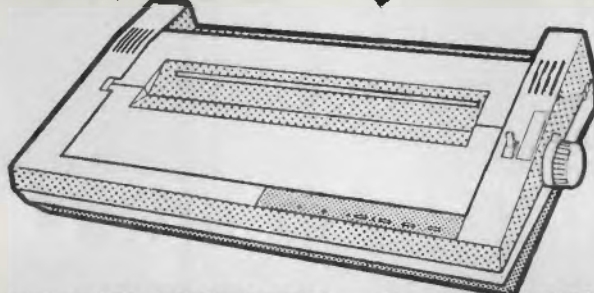
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TOSHIBA PORTABLES AREN'T ALL OVER THE P

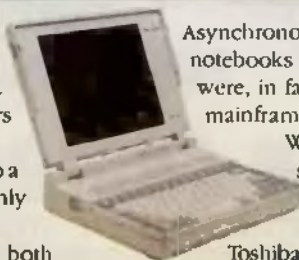
The great thing about portable PCs is their ability to travel all over the place, go wherever they're needed.

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Toshiba launches its first SL laptop

Top: Toshiba's T3300SL notebook;
Bottom: the T6400 series



Toshiba has launched its first SL-based laptop. The good news is that the specifications look good. The bad news is that it doesn't look significantly cheaper than the Zenith SL that has had most of the running for the past few months.

Last month, Zenith launched an enhanced version of its MastersPort SL for the same price as the original £3695, but with a larger hard disk (85Mb) and faster processor (25MHz 386SL).

The Toshiba 3300SL costs £3475 and has very similar specifications — 2Mb RAM expandable to 8Mb, and an 80Mb hard disk. Expansion is where the machines differ. The Zenith offers an Enhanced Parallel Port (which works faster when using Xircom network adapters), while the Toshiba has a PCMCIA

2.0 slot for memory cards and modems, and a connector port for a Deskstation IV. For £565 extra, that unit gives you two ISA slots, standard serial and parallel ports (passed through from the portable), a monitor stand, keyboard ports (PS/2 and regular) and mouse ports (PS/2 and regular). Provided the silly price is discounted heavily on the street, the 3300SL is not bad. The two other models launched at the same time are a bit less mainstream.

Toshiba has taken its time producing a 33MHz 80486DX colour portable — we reviewed Compaq's one three months ago — but has used the time well. It has emerged with a machine with an 'official' price of £6499 — still monstrously expensive, but £500 cheaper than Compaq's, with a 200Mb internal drive instead of the 120Mb. Compaq does a 210Mb version, but that adds a further £700 to its price. At 5.9kg, the T6400DX is also an arm-stretcher, but more than 2kg lighter than the Portable 486c. It starts with the same amount of memory (4Mb) but while the Compaq expands to only 8Mb, the Toshiba can hold 20Mb.

The Compaq machine has two EISA slots and a SCSI port (principally designed to take CD-ROM players). The Toshiba only has one, ISA slot, plus a dedicated slot for Toshiba's own modem cards. You can mount a CD-ROM drive internally, but then you lose the 3.5in floppy disk drive.

These machines are just status toys, though, in their colour configurations. If you need to carry around a number-crunching monster without blasting your wallet too badly, Toshiba's 6400DX is also available with a gas plasma screen for £4450. Moreover, Toshiba has launched a less-powerful, 25MHz 486SX version of the T6400DX — oddly enough called the 6400SX. It features a smaller, 120Mb hard disk and costs £5750 in colour, or £3625 for the gas plasma version. To be honest, if you are determined that you need this kind of power on the move, you may as well spend the extra for full DX power.

Toshiba is on (0932) 841600.

David Brake

As-you-were board is revamped

Emerson Computer Power has just released the latest version of Accucard, a board that saves all your data in the event of a power cut.

Accucard 386 is designed to run under Windows 3.0 and DOS 5.0. New features include the ability to move immediately between various applications, doing away with the need to save files. Windows does the same with only a small time delay, and if all your programs are DOS-based, then DesqView may well fill this need.

A more useful feature enables a single keystroke to bypass program data and file loading, dropping you straight into an application, which helps inexperienced staff. The card can also autosave after a certain time or number of keystrokes. A sleep

feature saves your work as you leave it, so you can resume where you left off.

In a power cut, the program works by saving your data to temporary files, which take up space on the hard disk equal to the amount of RAM you've got, plus your video RAM and your TSRs. However, it doesn't regulate power spikes, which would be nice.

The product costs £169 plus software. Some features may be worth it, but I'm inclined to think that if you've got Windows already, then you're better off getting an autosave facility or a cheap UPS, which will set you back £176 from Emerson. Emerson Computer Power is on (0793) 524121.

Danny Bradbury

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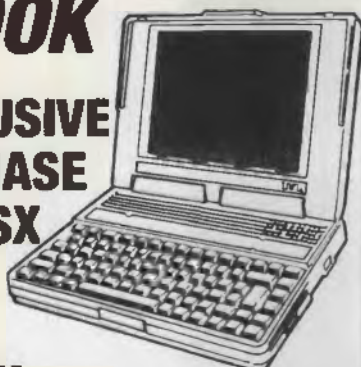
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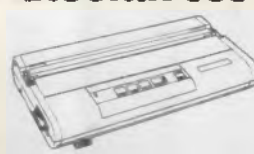
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Turbocharged NeXT steps onto the 486

Steve Jobs has finally succumbed to the pull of the commercial market by announcing a version of his operating system, NeXTstep, for Intel's 486-based platform. The company also announced a series of 'Turbo' NeXT machines to beef up the speed of the designer system.



▲ The high-speed 33MHz 68040-based colour NeXTstation

NeXTstep/486 was announced in late January at the NeXTworld Expo in San Francisco at the same time as version 3.0 of NeXTstep for the NeXT platform. The platform is designed to position NeXT much more competitively against Microsoft and Sun, according to NeXT's UK managing director Richard Strong. He points to May or June as a likely

time for shipment of the developer and user versions of NeXTstep/486 after beta testing ends. Rumour has it that both Dell and Compaq intend to produce NeXTstep machines.

Version 3.0 of NeXTstep provides more connectivity tools, more colour, and integrated help, according to the company. Tools for developing database and 3D database applications will also be included. The software will remain as true as possible to the original system, promises Strong. But some features on the original NeXT machine, such as the high quality sound afforded by the Digital Signal Processor (DSP) chip, will not be

available on the 486. Instead, the system will be adapted to make the best of the Intel hardware.

The company is also expecting OEM deals with hardware manufacturers to emerge over the NeXT couple of months. Strong was remaining cagey about names, but the word is that Compaq and Dell will move to support the software.

High-speed models

Meanwhile, there are high-speed versions of the NeXTstation, NeXTstation colour and NeXTcube computers, built around the 68040 running at 33MHz rather than the old 25MHz version. This, says NeXT, will give users 25mips over the old 18mips performance. These machines are still using software-based Jpeg compression for their multimedia capabilities, even though CCube now has a Jpeg chip on the market.

The reason is that NeXT isn't sure which way the wind is blowing yet as regards compression standards, and doesn't want to make the hardware investment until it is absolutely sure, Strong says. Highlighting some of the company's multimedia plans for the future, he said that users should eventually be able to pass around animated presentations using Ethernet.

Also announced was a four-colour printer for the NeXT machine using Canon bubblejet technology. Printing at 360dpi with a 64-head nozzle, the machine is capable of printing true black, and prints all four colours in a single pass. It also has PostScript level II capability.

With the reputed ease of developing applications for NeXTstep, this move could be Jobs' key to expansion. It's probably no coincidence that he's announced it a short time before Sunsoft's Solaris 2.0 appears, which will include the SunOS operating system for the Intel platform.

NeXT UK is on 081-565 0005.

Danny Bradbury

Microsoft shuffles away OS/2 Lan Manager

A reorganisation of Microsoft's Systems Development Group casts further doubt on the future of LAN Manager on OS/2. The Network Business Unit is being disbanded in the shuffle, and its staff is being distributed between Personal Systems (responsible for DOS and Windows 3.X), Advanced Systems (responsible for 'an object-based applications environment, enhancements to the Windows interface and other future projects), and Corporate and Network Systems (responsible for NT, LAN Manager, SQL Server and Communications Server).

Development

Microsoft is at great pains to insist that it 'will continue to develop LAN Manager for OS/2, Unix and VMS servers in addition to a version for Windows NT', and for the moment this may be true. But I imagine that most of the new features built into LAN Manager in the future will go to NT first and

the rest later — perhaps much later, or not at all.

The good news is that current rumours indicate that Windows NT will come with file and printer sharing built into both the 'desktop' and 'server' versions of the software. You will need the 'server' version to get sophisticated administration and fault tolerance, but the 'desktop' version should do what most people require.

While it now looks as if the first release of Windows 3.1 will lack peer-to-peer networking, we are promised that it will emerge with an add-on product, codenamed 'Sparta', later in the year. Moreover, from the launch of Windows 3.1, OLE, currently limited to standalone machines, will be network-capable.

Once all of this happens, with Ethernet adapters already available for less than £100, there will no longer be any excuse not to be networked.

David Brake

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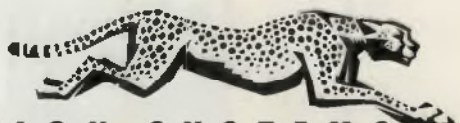
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MacWorld news

The MacWorld San Francisco show this year didn't see any major hardware launches, but there were a succession of mini announcements.

QuickTime takes Word 5.0 to the movies

Apple's multimedia handling software was formally introduced at MacWorld (though it has been discussed and previewed extensively beforehand). The show was dominated by a variety of QuickTime products and add-ons to existing products. I won't list all the new hardware products — there are too many, and most are new only in the adjustments made to the software controlling their boards.

Microsoft, with its application developer's hat on, announced that it was adding QT support to Word 5.0 now, and to Excel 3.0 in the first quarter. QT will allow Word to embed moving pictures in a document, and Excel to create moving graphs by treating each one of a series of graphs as a 'frame' in a moving picture.

Apple pushed QT as a cross-platform solution by revealing that it is working on a Windows 3.0 'player' to allow PC playback of QT 'movies' from within Windows programs.

David Brake

Frontier gives Mac users batch-file power

Once upon a time there were rumours abroad in the land of a product called AppleScript that would allow experienced Mac owners to control their machines using a language, rather than point and click. After several years, nothing emerged. Then came similar whispers about Frontier — a third-party product which would do much the same. After a year or more of waiting, it has arrived.

Back to the command line

So why would Mac users, who have paid a lot over the odds for a snazzy icon-based interface, want to go back to the command line? The idea is to allow the Mac to do things that command-driven interfaces could do for years — batch files for back-up,

for example, and scripts to automate frequent operations, in the foreground or the background. And because Apple's System 7 enables AppleEvents, you can pass instructions between programs which support them (hardly any at the moment, but this will change). QuickKeys, from CE Software, does some of this, but because it is icon-based and descended from a keyboard shortcut program, it isn't anything like as sophisticated.

So if you have been longing to really get to grips with the Mac's operating system, the company to call is Userland on 0101-415 325 5700. It costs \$179 plus shipping, and discounts are available for five or ten-user packs.

David Brake

New 16in screen

Mac owners who want more screen real estate will be keen to snap up Apple's new 16in colour display. At £1195 it isn't cheap but it will run off the Quadra's built-in video: on other models, you have to buy a card. Because of the new screen, the Apple 21in colour display is being reduced in price by £200 from the stunningly-expensive £3295 to £3095.

Free System 7.0 Tuneup from Apple may make SANE users mad

Apple will be introducing an upgrade of System 7.0 called 'System 7.0 Tuneup'. This will be available free from dealers or from Apple itself (pro-

vided you bring or send in a disk) and will be downloadable from on-line services. 'Everyone who has System 7.0 should get this,' advises Clive Girling, Apple UK's Product Marketing Manager for System Software.

Benefits include improved performance for file copying and other Finder functions, the ability to save around 150K of system memory by turning off all networking functions, and faster printing. Memory management is better: when you run out of memory to load a new application, you will be asked if you wish to quit from any seldom-used programs; and the system should no longer take more and more memory as the day goes on.

People using SANE routines — Apple's standard way of using floating point routines — will be disappointed, however. System 7.0.1, available only with the latest machines, provides a big SANE performance gain (2-3 times faster). But this benefit is not included in the TuneUp. Girling says, however, that programs which use the FPU heavily tend to access it directly, bypassing SANE, so few users would notice any benefit.

David Brake

Cheap chip cuts price of fast board

Sleazy marketing gimmick or not, the Motorola 68LC040 is undeniably cheap. Based on the same idea as the 486SX, the 68LC040 gives you most of the performance of the top-of-the-range 68040 processor. But with the floating point unit cut off, the chip is selling for a fraction of the cost. The new Rocket 25i from Radius is the first accelerator card to make this available to Macintosh users, and it costs £1299 — a saving of £700 over the cost of the original Rocket, even with the price cut.

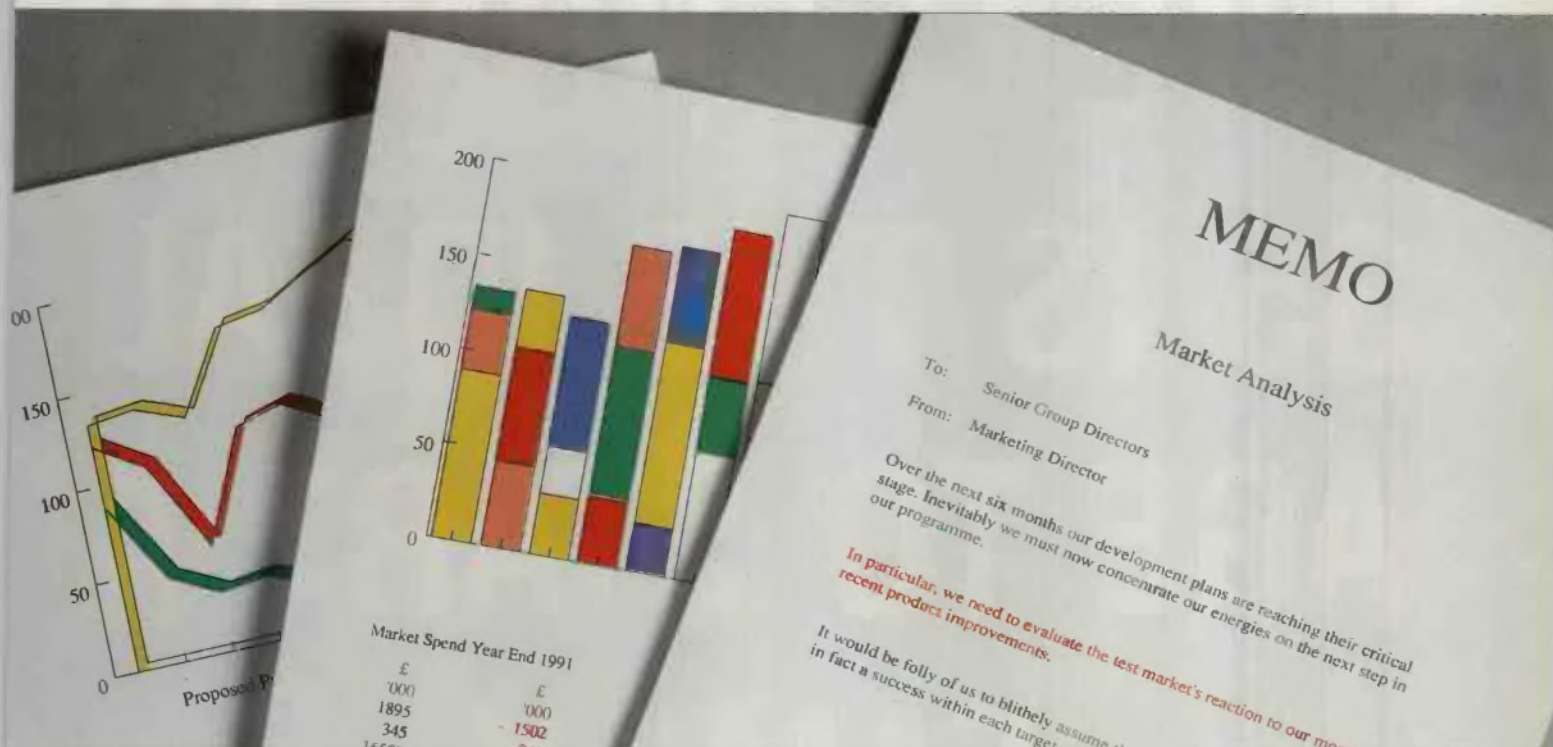
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David Brake

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Court verdict is due soon in crucial battle of the GUIs

 This year should see a series of pivotal rulings that will dictate the future of the computer industry. We should hear more from the Federal Trade Commission about its important investigations of Microsoft and Intel. A verdict or settlement is likely in the dispute between Intel and chip cloner AMD. But most important of all, in terms of its impact on the industry, is the dispute between Apple and Microsoft (not to mention Hewlett-Packard) over Graphical User Interface rights.

Ironically, none of the companies involved in this dispute can claim to have invented the GUI. The famous Mac graphical interface, introduced in 1984, actually had its roots at the Xerox' Palo Alto Research Center (see page 246). But, amazingly, Xerox never applied for a copyright on its original GUI. Steve Jobs and his team created a derivative, stuck it on the Mac, and promptly copyrighted the GUI and its 'look and feel'.

Apple has ever since claimed legal rights to *any* GUI. Microsoft actually bowed to this claim in

1985, when Bill Gates applied directly to Apple for a licence to enable his own 'windowing' product. At that time Apple saw itself as a hardware company, and had not yet understood that the Mac GUI was its greatest asset. It granted Microsoft a licence to use around 180 GUI 'elements', including pull-down menus and mouse control, in Windows 1.0. Microsoft sub-licensed this GUI to Hewlett-Packard for use in the New Wave GUI, and also used it in the OS/2 Presentation Manager interface.

Apple claims the GUI facilities in later versions of Windows exceed the 'limited licence rights' granted for Windows 1.0. It has asked the courts to stop the sale of Windows 2.03 and 3.0, and HP's New Wave, and to impound and destroy

all copies. Apple is also claiming very high damages. Sources close to the suit believe Apple will also try to prove it lost a lot of money due to Microsoft's 'illegal' use of the interface, and will claim all Microsoft profits on Windows 2.03 and 3.0, as well as mouse sales.

Apple lists 10 'visual elements' not covered by the 1.0 agreement, including some major features. For instance, former Windows 1.0 users will remember that its windowing style was 'tiled': you could open up to six windows at any time, but only side by side. Windows 2.03 and 3.0 implemented *overlapping* windows, as seen on the Mac. Also, Windows 1.0 icons were fixed. Windows 2.03 and 3.0 allows the icons to be 'parked' anywhere, as on the Mac.

The GUI has become so central to computer use that anyone who owns a relevant copyright, or even a legal licence, will have a lot of clout. Clearly, Apple sees itself in the driver's seat in this respect — with only Microsoft standing in the way of complete market domination.

Microsoft believes the terms of its original licence allowed it to extend Windows in many ways. But its decision not to pay an extra licence fee could be a real problem in the long run. There is no question in my mind that Apple will not even consider a compromise on the issue. It might have done two years ago — but now the company sees more power within its grasp. If it wins the suit, it will make life hard for Microsoft.

Proof difficult

But some legal sources believe that Apple will have a difficult time proving without a shadow of doubt that its copyrights were actually violated. Microsoft and Apple may still settle out of court.

Other experts think that Apple will win the case and force Microsoft to change the ten disputed GUI elements. This could have a domino effect, affecting applications using Windows 3.0, New Wave and Presentation Manager. Apple will aim for a 12-month advantage in the market while Microsoft and other affected parties adjust their products.

Apple's new alliance with IBM will be important in this. IBM already has a licence to the Mac GUI for use in its Unix product, and I expect this use to spread to OS/2 some day. Together, the companies could make the Mac GUI a serious standard in business.

It is impossible to predict the judge's ruling, which is expected this summer. If Apple wins and then refuses to grant licence extensions, Microsoft could be forced back to the drawing board — though it's probably working on contingency plans already.

Ultimately, I believe that the Mac GUI and Windows (in one form or another) will still have to fight it out in the marketplace.

Tim Bajarin

SCSI notebook prices drop

Two months ago, we found a SCSI-based laptop for £3000. This month, we have heard of one for less than half that sum. For £1299, the Answer Diplomat is a 25MHz 386SX-based portable with 2Mb of RAM and a 60Mb hard disk. Like the Vortec machine we found before, the Diplomat can work with C-type batteries (eight of them) as well as rechargeable NiCad packs.

The SCSI bus should allow you to connect a variety of peripherals like external hard drives, LAN adaptors, or tape streamers. There is no room inside for modem or other cards, but external modems are getting pretty small and cheap these days anyway.

These specifications look so similar, I imagine the guts of the machine are very similar. I am told that a third manufacturer, Reeves, also offers something along these lines. So it looks like there'll be a flood of SCSI notebooks shortly.

If SCSI appeals to you, give Answer a ring on 071-386 8006. Or check with Vortec (081-862 9311) to see whether they are realigning their prices.

David Brake

Amstrad U-turn on prices as rivals join the cuts merry-go-round

The latest round of PC price cuts from various vendors contains some interesting moves, including a U-turn from Amstrad and the start of a possible price war between sworn rivals Elonex and Copam.

The Amstrad cuts are the most interesting. Amstrad has had to cut prices again following a statement by chairman Alan Sugar about the need to clear stocks. At one point last year, he was calling for a return to higher pricing.

This rethink will mean you can pick up a 16MHz ALT 286 portable with 1Mb RAM and a 40Mb drive for £999 — a £600 cut. Or a 20MHz 3386SX with 4Mb RAM, an 80Mb drive, a VGA mono monitor, Windows 3.0, and a mouse, for the same price — a £500 cut.

Meanwhile, Elonex has been busy hacking prices. Its PC320-X 20MHz 386SX with 1Mb RAM and 40Mb hard disk drops £50 from £945 to £895. This is less than the Amstrad system, and although the Elonex unit has only half the fixed storage capacity, it does include a colour SVGA monitor.

The Elonex PC-433 33MHz 486 machine with 2Mb RAM and a 40Mb hard disk shuffles down £100 to £1495. And the PC-450, a state-of-the-art 50MHz 486 with 2Mb RAM, plummets £150 to £1995 — though with only a 40Mb disk. Elonex claims that these price cuts reflect lower component costs stemming from 'economies of scale and the weakness of the dollar'. It keeps its one-year on-site warranty.

These price cuts bring the Elonex within spitting distance of rival Copam, which recently entered the UK market with rock-bottom prices. Its 386SX costs £5 cheaper than the Elonex, and its 33MHz 486 is £75 cheaper. But Copam has no plans for a 50MHz 486 model, and it seems strange that Elonex has dropped pricing on this model so soon.

Dell has sliced prices across the board. Examples include the small footprint 325P 25MHz 386SX with 1Mb RAM, 50Mb hard drive and colour VGA — reduced from £1449 to £1149. Biggest saving comes on the 450SE EISA 50MHz 486 tower system with a 320Mb hard drive and colour VGA — down £850 to a mere £5799.

Digital has also hacked its prices by up to 53% in a bid for a 5% share of the PC market by 1993. (See Jack Schofield, page 99.)

Volume discount

Significantly the company is cancelling its Digital Business Agreement, too — this means that corporate buyers will no longer get discounts based on their total annual spend; instead they will get a more sensible volume-discount arrangement, like everyone else.

Terminal giant Wyse has been cutting prices by up to 38% to ramp up sales. A 20MHz 386SX with

a 40Mb hard drive now costs £895, while the desktide Decision 486/33T Model 1 with no hard disk drops from £4105 to £2675.

The company has even dropped prices on its 286 range, knocking a 12MHz WY-2012i machine with 1Mb RAM and a 40Mb drive from £1025 to £720.

Panasonic has lowered the Suggested Retail Price on its notebook range, making them a little less overpriced. The CF-370 386SX is down £644 to £2251, while the CF-270, a 20Mb 286, is down £515 to £1280.

Commodore prices have also dropped. A 16MHz 286 with a 40Mb hard disk is down roughly £300 to £649; while a 20MHz 386SX with a 40Mb hard disk and Windows 3.0 sells for £849.

▽ The Panasonic range of notebook PCs



Amstrad (0277) 228888; Elonex 081-452 4444; Wyse (0734) 342200; Panasonic (0344) 853550; DEC (0734) 868711; Dell (0800) 414535; Copam 081-961 9555; Commodore (0628) 770088.

Danny Bradbury

Wait for the new LC

Apple UK is doing some discount bundling deals of Classic IIs and LCs with its own printers, but I don't feel inclined to tell you too much about them. You see, if what I hear is true, the LC is about to be replaced by an improved model in March — in fact, with a machine resembling what should have been launched all along.

Similar in most respects to the original LC, this version will have a 68030 processor, like the Classic IIs, so that it can take advantage of virtual memory.

A brickbat for Apple on the mounting of DOS floppies, as well. For a while, it has offered a very clumsy solution. In March, we expect that it will launch a proper one, based on technology from those clever British people at Insignia Solutions. Unfortunately, it looks as if Apple means to charge extra for it.

David Brake

Adobe boosts Illustrator for Windows



Adobe is trying to gain the high ground in the Windows drawing package marketplace with an upgrade to Illustrator 4 which gives the Windows version more features than the Macintosh one.

Illustrator slugs it out with Aldus Freehand for the Mac market, but in the PC world both are well behind the PCW Award winner, Corel Draw!. Among the improvements designed to push Illustrator forward are the ability to type and manipulate text directly on the screen, a graphing tool, editing in colour and (something other packages surely have to address soon) the ability to have

multiple files open simultaneously.

Perhaps Adobe's most important claim is that Illustrator 4 will be twice the speed of Corel Draw! 2 and much faster in text manipulation — a claim we will certainly be testing.

Adobe also benefits from its heavy penetration on the Macintosh and its presence on DEC and NeXT machines — files generated on these are all cross-compatible.

Illustrator will cost £565, which is pretty steep, but bundled with that you get Adobe Streamline 3.0 (an update to Adobe's bitmap to vector conversion package), TypeAlign (a type manipulation package), Adobe Type Manager 2.0, a selection of 25 Type 1 fonts, another collection of PostScript tints and patterns, and Adobe Separator (to make colour separations for professional printing).

All this should be available some time in the second quarter of this year. Principal Distribution on (0706) 217744 will deny everything until then.

• Rumours are starting to surface about the content of Corel Draw! 3.0, due this summer. Apparently, Corel will be adding charting facilities, and will enable editing in colour and on-screen text editing. In other words, it will promise many of the features Illustrator is touting at the moment. Of course, we don't yet know how the user interfaces and speeds will compare.

David Brake



'Spy' utility reads coded files

Have you ever password-protected a critical file, then found you couldn't remember the password? Or has a disgruntled employee encrypted files and left? Or have you stolen the financial results off your boss's hard disk only to find you can't read them? Don't be frustrated — get AccessData! Just £149 can give you that lost or confidential data at your fingertips.

Bev Nicholls, the Sales and Marketing Director for distributor Key Exchange, says: 'We are aware of the sensitive nature of these products, so they contain their own security measures against unauthorised use.'

Well, they *do* contain a password so that only authorised users within a company can use the software once it is bought, and there is a way to make a password that is unbreakable, even using the product. Key Exchange is also consulting the vendors of the products that can be broken (WordPerfect, Lotus 1-2-3 and Symphony, Microsoft Excel, Borland Quattro Pro and Paradox), to see what procedures they would like put in place. It will probably consist of something like a form for purchasers to sign, which has to be countersigned by a company director. And they promise not to sell it to just *anybody*.

There are four different versions, each of which decrypts files from a different set of programs. They cost £149 each, or £499 for the whole set. Only DOS versions are supported so far, but a Mac-based decryptor for Word and Excel is due later, along with Windows decryptors.

Key Exchange is on 071-498 9005.

David Brake

Symantec rushes upgrade for GreatWorks

Symantec's assault on the Mac market continues with an upgrade of GreatWorks, the inexpensive integrated package, after only six months on the market. GreatWorks has been doing reasonably well, but the early revamp was spurred by the launch of ClarisWorks and the imminent launch of BeagleWorks.

GreatWorks 2.0 will steal some of BeagleWorks' glory by beating it to become the first integrated package on the Mac to support System 7's Publish & Subscribe. It takes a page out of Claris' book by supporting 'In-context editing' — when you embed a spreadsheet in a word processor document, if you click on it you switch to the spreadsheet automatically. Other added features include a colour Paint module (the previous one was black and white only) and a print preview available across all eight modules.

Best of all, it's extraordinarily inexpensive. Until the end of March, if you have *any* Mac application you can buy GreatWorks for £79 — the regular price is £145 and the upgrade from version 1 costs £49.

But that's not the only Mac news from Symantec. According to US sources, the Mac version of Q & A, the flat-file database and word processor, should be ready some time this spring.

Q & A on DOS has been very popular for some time now. It combines a word processor with a database — both of them easy to use, and integrated to make mailmerges simple. On the Macintosh, Q & A will combine a database functionally similar to Claris' market-leading Filemaker Pro, but with natural language operation similar to its DOS equivalent, which allows you to type in something like 'show me voters making more than £20,000 in marginal constituencies' and get a meaningful response. The word processor will be like WriteNow, including all the basic functionality users require.

Symantec is on (0628) 776343.

David Brake

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PCW392

Anti-virus firms vie to beat PC fun and games

Despite countless anticlimaxes on bank holidays and Friday 13ths, viruses are still making the news. Most recently because of *PC Fun*, a games magazine which had to withdraw a cover disk infected with the 'Stoned' virus.

A couple of interesting programs have been brought onto the market recently, which may help you to keep your files clean and healthy.

The first, Quarantine, from US-based On Disk Software, is angled at the corporate market. Sole UK distributor Field Systems is now shipping version 1.3, which has support for more servers and larger files. It is designed to be installed on a network and to check not only for infected files, but also to give early warnings for failing disk subsystems. It even claims to spot careless hackers and checks all files up to a maximum of 1.6 million from up to 65,536 drives.

The system uses both a scanner and a 'cryptic' file checking program. The scanner is run when the package is first installed and checks all files for any viruses already on the system. This works by using a database containing known virus signatures, together with a search mechanism which scans all files on the system for those signatures.

Suspicious change

After installation, the other element of the program comes into operation, which looks for the effects of virus contamination, primarily identifiable by changes in file length. It checks all files between backups to see if they've been changed and reports the differences to the network manager who can then decide if the change is suspicious. It should be run directly before backups, so that the backup is then known to be clean.

It can be run on two levels: either as a quick check, where it does a simple CRC check on all files; or, more sensibly, using a polynomial CRC algorithm (many viruses can fool normal CRC algorithms by disguising themselves so that the CRC in a file doesn't appear to be altered). The system uses a password to help generate the cryptic CRC code — important, because cunning virus programmers can otherwise disassemble a program's algorithm to find out what the code is.

Field Systems has chosen to market the whole system for a single £1000 licence — regardless of company

size, which seems a little unfair. However, there were hints that this would be 'negotiable'.

Norton Antivirus 2.0, a new version of Symantec's virus buster, began shipping recently. Running under Windows or DOS, the product recognises more than 1000 virus strains and uses a TSR to scan for virus signatures. It also includes a cryptic file checker, designed to provide double protection. Unfortunately, it does not use a user-defined password to help create the cryptic formula, making it easier to outwit the checking algorithm. On detecting a virus the program will attempt to repair the file and will then rescan it, to make sure there are no other viruses lurking within the code.

One interesting feature of Norton Antivirus 2.0 is the rescue disk which the program creates upon installation, saving basic system information including CMOS data, the disk FAT and partition tables. This will give users the chance to retrieve the basic structure of the disk should the unmentionable happen, says Symantec. The program costs £149. An upgrade from any old version of Norton Antivirus costs £29.99.

Prevention rather than detection seems to be the aim of the game for security consultant International Data Security, which has just started distributing version 3 of PC Guard, with improved virus protection. But the main improvement seems to be in the structure: user groups can be defined for restriction and screening purposes, and individual user environments for timeout, virus protection and access rules.

PC Guard works by making all executable files Read Only, thus ensuring that no viruses hide themselves within a program. This of course creates problems with programs that write to themselves, though these are few and far between. The program does contain a facility to exclude some files, but this seems to defeat the point somewhat. Boot sector and debug viruses, which operate at a very low system level, cause the program to freeze the system completely, allowing the user to run a scanner program to weed the rogue program out.

The program's improved timeout facility means that the machine will freeze until you enter your password, which is handy for coffee breaks. Also included is a timeslotting facility, whereby you can specify the periods in which people can log on. The network manager can also decide which users are allowed to install software.

A single-user version of PC Guard costs £195, while a 10-user pack will set you back £1450. A 100-user licence is also available, where you get just two disks and two manuals for a mass installation. The price for that is on application.

Those infected by the *PC Fun* disk found a message on their screens saying 'Your PC is now stoned'. Data loss was possible on 1.2Mb floppy disks holding more than 32 files. The virus works only if you accidentally boot from a contaminated floppy.

International Data Security 071-6310548; Fifth Generation Systems (0494) 442224; Field Systems (0932) 254733; Symantec (0628) 776343.

Danny Bradbury

Piracy in the Spanish main

According to estimates from the Software Publishers' Association, the UK is the most honest country in Europe when it comes to software piracy, while the Spanish and Portuguese appear to be chronic. The SPA calculates this by finding the number of applications bought per machine sold. In the UK, we buy about one DOS application or 2.7 Mac applications for each machine sold. In Iberia, on the other hand, users seem to be able to survive with less than one (purchased) application for every three DOS machines they purchase.

Unless they use their machines really strangely in Spain, there's an awful lot of yo-ho-hoing going on over there. In the US, where disposable incomes are high and numerous mail-order houses cut software prices, they buy 1.78 DOS programs per machine. This is still less than the three packages per PC (or five per Mac) that people are supposed to be actually using.

David Brake

Visual Basic directory from Microsoft

Microsoft has moved to gather support for its Visual Basic programming language by releasing a directory of programs using the environment. Forty programs, either written in Visual Basic or for VB users, are included. Microsoft stresses that not all are available in the UK. The company itself has written two programs — a £99 Lan Manager toolkit and a £395 SQL library.

Meanwhile European Software Publishing has enhanced its Forest and Trees management information package with a front-end service designed

using Visual Basic. It allows users to integrate information into a bitmapped image — for example, a map of Britain with buttons situated at different locations, which when clicked provide a breakdown of current sales information for that region.

The service will be available through ESP and its dealers, although corporates will be able to provide the service themselves.

Microsoft (0734) 391123; ESP (0628) 23453.

Danny Bradbury

New bulk paper handler

Newbury Data Systems has released Towerfeed, an automatic sheet feeder system for laser machines, enabling you to print in bulk or to select different forms. The product, originally from Swiss outfit Rutishauser, comes in desktop or floorstanding versions. It consists of drawers, some of which feed paper directly and some which store it. Newbury Data claims that the Towerfeed is compatible with any system using a Canon SX engine.

The Towerfeed 444 model can have up to five feeder drawers holding 500 A4 sheets each. This enables it to be used as a bulk feeder, holding up to 2500 sheets in one run, or a demand feeder, holding up to five different types of paper selectable by commands embedded in documents. The demand facility makes multipart forms on a laser printer easier to produce, and also does away with the need to change paper types for different users when using a printer on a network, according to the company.

The 222 model has two feeder drawers, enabling

it to feed up to 1000 sheets at a time.

A two-drawer desktop version of the 444 costs £1295; the five-drawer floorstanding version with two extra storage drawers costs £2500. A desktop version of the Towerfeed 222 with two drawers will set you back £895.

All very convenient, undoubtedly, but at these prices you will also be pleased to hear that the product is available on lease, too.

Newbury Data
(0784) 461500.

Danny Bradbury



Multimedia graphics board from CCG

Cambridge Computer Graphics has released a multimedia hardware unit to beef up presentations and editing processes using CAD, graphics and video functions.

The CCG PCV-32 board is a 32-bit full colour graphics card which can be upgraded using various modules, which will become available in time. The first is a video capture and display board using a Jpeg chip.

The PCV-32 uses a TMS34020 processor, giving a resolution of 1024x768 with a 70Hz refresh rate. Features include up to 32-times magnification, and direct throughput to the graphics processor for live video displays.

It is designed to work primarily with Autodesk but also includes a 24-bit paint package which operates under Windows 3.0. The system costs £3500.

Cambridge Computer Graphics (0223) 863311.

Danny Bradbury



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WS16X £650

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Included as standard: 80386SX running at 16MHz with 1Mb RAM expandable to 16Mb (LIM 4.0 EMS compatible). 1 x 3.5" 1.44Mb floppy drive. Super VGA (1024 x 768). 2 serial ports and 1 parallel port. IDE hard disk controller. 102 Key Keyboard. MS-DOS 5.0 and Windows 3.0. Mouse.

	Mono VGA	VGA	Super VGA
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40Mb	760	795	855
80Mb	830	865	925
120Mb	910	945	1005
200Mb	1005	1040	1100

WS333 £910

386DX 33MHz

Included as standard: 80386DX running at 33MHz with 64Kb cache expandable to 256Kb. 4Mb RAM expandable to 32Mb (LIM 4.0 EMS compatible). 1 x 5.25" 1.2Mb and 1 x 3.5" 1.44Mb floppy drives. Super VGA (1024 x 768). 2 serial ports and 1 parallel port. IDE hard disk controller. 102 Key Keyboard. MS-DOS 5.0 and Windows 3.0. Mouse.

	Mono VGA	VGA	Super VGA
No HDD	910	945	1005
40Mb	1020	1055	1115
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120Mb	965	1000	1060
200Mb	1060	1095	1155

WS433 £1280

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Shell security for networked Windows

Network managers having problems with Windows are being offered an alternative in the form of Windows Workstation V4, from the Roderick Manhattan Group.

The latest version features the Applications Manager, a replacement for the Program Manager shell. This is said to give users more security

features — the company believes that the lack of central control and security are a major drawback of Windows on networks.

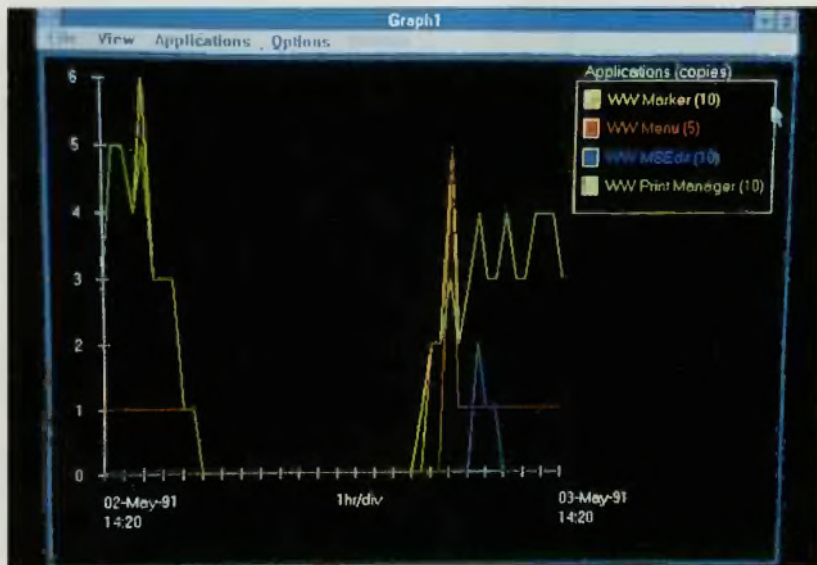
The program provides a network scripting language called Multiset, which uses the Netware login script syntax to help build Netware compatibility into menus. There is also the network print manager, which allows the network manager to configure and control network printers centrally.

A 'software meter' provides a record of how many copies of a program have been used on a networking system at any one time. This enables managers to provide a report should FAST burst through the door. It also encourages the new trend, followed by Lotus and WordPerfect, of allowing licences for fewer copies than there are nodes on the host network, so long as the number of copies in use at any one time does not exceed the licensed amount.

Windows Workstation V.4 does not actually prevent you using more copies of a package than you are licensed for, but it will record the fact that you have done so. The company says that this may be rectified in a future version.

Roderick Manhattan Group 071-9781727.

Danny Bradbury



Alpha Four 2.0 launches in the UK

Alpha Four, said to be one of the best-selling databases in the US, has recently announced an upgrade and opened a UK office.

The field of relational databases is going to be furiously competitive — Borland (which has swallowed up Ashton-Tate) and Microsoft are both readying powerful databases. But Alpha Four is not aiming at the same market. Mike Holman, UK office head, says the key to Alpha Four's success so far is that it lets non-programmers exploit the power of a relational database. It can read dBase files, and the new version is Novell and Netbios compatible.

It doesn't give you access to the dBase programming language, but that's supposed to be a feature, not a bug. Holman says Alpha Four uses the same data format as dBase, so you can do the interface and initial programming with Alpha Four (supposed to be easier) then take it across to dBase or its clones for low-level fiddling. Obviously the Power Users lobby has had some influence, though, as the latest release has PowerScript — not quite a programming language, but getting there.

Limited database spec

A characteristic of Alpha Four that makes me somewhat suspicious is its limited database specifications. You can have a maximum of 128 fields and 4000 characters per record — such limitations are considered rather passé in databases these days. What makes me even more suspicious is that one of the enhancements in version 2 is support for PostScript — Courier font only!

Clearly, DOS-only Alpha Four's presentation abilities are limited: it's basically a 'text boxes' product. A Windows version is targeted for the end of the year.

Pricing for the new version is £345 for a single-user version, £395 for a multi-user version (first user) and £495 for an additional three users. Alpha Four UK (0752) 606881.

David Brake



Lotus faces rival in e-mail market

It seems that the e-mail battle is only just beginning. Microsoft and Lotus are arming up with the latest version of their software packages, both of which now include some intelligent features including mail enabling for (their own) applications.

Microsoft launched into the PC e-mail market as late as June last year after buying Network Courier from Consumers Software and renaming it Microsoft Mail. The latest announcements from the company include seven additional gateways for the software. These enable you to mail into IBM PROFS, fax, X.400, SMTP/Unix, the Novell Mail Handling Systems, and the popular US standard MCI Mail. There is also an IBM SNADS gateway, which is shipping in conjunction with third parties Softswitch and Linkage.

Microsoft Mail 3.0

The most important announcement, however, comes in the form of Microsoft Mail 3.0, which now includes a global directory. This is essentially a flatfile database of all e-mail addresses on the system, which does away with the inconvenience of updating numerous individual postboxes. Automatic global directory synchronisation is standard.

Another major enhancement includes mail enabling, which means you can send mail from within applications. The program also provides support for Object Linking and Embedding, which lets you insert data and graphics from applications directly into the body of e-mail messages. The recipient can then edit the data from within the message, using

the application that originally started it.

Other natty features include mail sorting, which categorises incoming mail according to sender, subject or even content, using character strings. This, says Microsoft, will help heavy e-mail users decide exactly what to read. Users can also



spellcheck messages that they want to send.

Lotus is running its own battle with version 1.1 of cc:Mail, which also has mail enabling. It has SmartIcons, which you click to trigger macros to perform functions such as replying to a message. Lotus claims that this helps people to learn how to use the product.

The product does not, however, include OLE support or message filtering. It is available now for £360 though, whereas Microsoft Mail 3.0 will cost £485 when it finally ships some time in the second quarter.

Microsoft (0734) 391123; Lotus (0784) 455445.

Danny Bradbury

UK frame-up leads to cheap videophone

Treen Technology of West Sussex has announced a system which it claims will transmit video images in more-or-less real time over a telephone line.

The Supervision Realtime Video Transmission System is a hardware/software combination which transmits monochrome video images at a rate of 2-10 frames per second between computers using a modem, cable or radio link.

The system transmits at 115200bps on a serial cable, or up to 38400bps on a 9600bps modem, depending on which compression technique you use. You can send data or text with the video images by using the program to interlace the transmission between frames. At present this is restricted to small messages or data files.

The program will be available for both Windows and DOS. On the DOS screen, the best resolution it can muster is 640x400, while the maximum resolution on the Windows version is a mere 320x200. Applications seem to be limited — video conferencing is no good unless you can use sign language, and faxes will normally do for most documents.

Security could be a big application, as in the summer Treen will release a semi intelligent add-

on for closed-circuit type applications which will recognise changes in the image being transmitted and issue an alert, should an intruder wander into view. The company is looking at a transputer-based hardware system using Intel's DVI chips to speed up the compression process, and possibly include speech, although funding is needed.

The system, including an image-grabber card and software, sells for £495 in an introductory offer. Two sets for transmission and reception will cost £795.

Treen Technology (0798) 813618.

Danny Bradbury

New jacket to ruggedise PCs

If you need a ruggedised industrial PC, you face a few problems. Not only do they cost well over the odds — you can easily pay £2000 for IBM's 20MHz 386SX machine, without a hard disk, for example — but suppliers are limited.

Intek Electronics, which makes ruggedised machines itself, has come up with a clever idea — an enclosure which can be used to protect any PC (well, any up to 550mm wide, 160mm high and 450mm deep). It still isn't cheap, at £1000 to protect the machine, the keyboard and screen, but at least you get to choose the PC you want inside. The kit includes a cooling fan, air and mains filter and anti-vibration mounting.

Intek is on (0352) 85603.

David Brake

£1199 PostScript printer

UK-based distributor Compumail International is shipping a 4ppm laser printer from US company Bezier Systems, which it claims is PostScript compatible. The BP4040 printer, which will ship for £1199, supports the TruImage page description language, recently abandoned by Microsoft.

The machine has a 16MHz RISC controller which includes 2Mb of RAM. The machine includes 35 Apple TrueType fonts, including ones from the

Arial, New Roman, Times, New Century Schoolbook and Zapf Dingbats families.

The machine, which is supplied with 2Mb RAM expandable to 6Mb, is based on the Canon LX engine. The input tray carries only 50 sheets, and either 50 sheet face up or 20 sheet face down output, selectable by the user. The model comes with Appletalk, serial and parallel ports.

Compumail services machines on a back-to-base basis, but also runs an on-site maintenance scheme for an additional £25 per year. After that there is an extension option costing £90 per year.

Whether it is desirable to have a printer based on TruImage rather than PostScript is open to question, as is the degree of compatibility with PostScript. Microsoft's recent announcement that it was backing down in the page description war with Adobe leaves Hewlett-Packard's PCL5 as the only other real contender.

The upside is that Microsoft will still support TruImage, and the Bezier machine is significantly cheaper than most true PostScript printers.

Compumail will be releasing other Bezier printers in the UK later this year, including 10 and 15 ppm models.

Compumail (0296) 397039

Danny Bradbury



ABS idiot-proof backup system

If you just don't trust yourself or other people to save your data, Solutions' new Automatic Backup Systems really idiot-proofs the process.

You connect the ABS to your PC parallel port of your PC and bingo — your data is secured. Yes, it seems to be really that simple. In the dead of night, after you switch off your machine, the unit switches it back on again. It then runs a batch file which backs up to the ABS's built-in tape drive. The ABS will also execute virus-checking or disk-optimisation software — anything you like, really.

It also includes an integral UPS with a 40VA rating and spike suppressor (should give you ten minutes before the batteries run down).

Prices at £795 for a 60Mb version and rise to £1495 for 525Mb. When the software is upgraded to include compression as well, the capacity should double; if you can't wait for Solutions to provide the upgrade, there's nothing to prevent you from using third-party backup software instead.

It isn't cheap, but it's around the same price as buying a UPS and tape streamer separately, and it's certainly useful.

Solutions (0959) 561204.

David Brake





FOR JUST £1299, TWINHEAD WILL GIVE YOU BACK YOUR DESK.

The Twinhead SuperNote SX packs a lot of computer into a small space, at a very small price: just £1,299 (plus VAT).

So much so, in fact, that it was voted best buy in *The Laptop Buyers Guide & Handbook (USA)*.

Weighing just 3kgs, it boasts a 386SX processor, 40Mb HDD, 2Mb RAM, 1.44Mb FDD, 32 grey shade VGA display with a connection for an external VGA monitor, 2 serial ports and 1 parallel port.

Also included in the price is a full year's warranty, carry case, THlink software and cables and DOS 5.0. Optional extras include Windows 3.0 and mouse.

It also comes with impeccable credentials.

Unlike many notebook PCs where the badge bears little relation to the machine's actual manufacture, the SuperNote was designed and manufactured entirely in Twinhead's own factory in Taiwan, where 10% of the revenue from every PC sold is ploughed back into research and development.

And all Twinhead notebooks, desktops and tower systems are configured and supported by our UK headquarters in Basingstoke.

If you'd like to know where to buy the SuperNote or any Twinhead product, please call us direct and we'll put you in touch with your nearest Twinhead Authorised Re-seller.

Just contact Julie Grange or Liza Nightingale on Tel: 0256-811366 or Fax: 0256-811142.



Twinhead

Windows is an acknowledged trademark of Microsoft.

Artisoft modem sharing on a LAN

Lantastic publisher Artisoft has come up with a package that allows network users to share a modem. Articom lets you dial in to mainframes, BBSs and other systems from within a LAN without disturbing the machine to which the modem is connected.

The system can also be installed onto dedicated machines which then act as modem servers, with each server sharing up to four modems.

The program runs as a TSR needing nearly 6K of RAM. Compatibility centres around the LAN API 14 interrupt. If your software supports this, then so will Articom. Compatible software includes Smartcom Exec and the Communication Research Group's Blast PC software. Articom costs £280.

PC Communications also produces a range of

software packages that will run on Novell NetBios networks to arrange dial in/out communications. The company's Cross and Connect software allows you to load up any of the tools that you use on the network without nominating a particular machine. Within this software there's a facility to enter chat mode and talk to other people who are also using the software on a LAN. The memory overhead for this product is less than 10K.

It is sold on a by-modem basis. The single modem version price is £695, while the five modem version costs £995. The 20-modem version retails at £1295.

Artisoft (0753) 554999; PC Communications (0628) 851111.

Danny Bradbury

New Mannesmann Tally printer

Mannesmann Tally has fleshed out its printer range with an 8ppm machine it claims knocks spots off Hewlett-Packard's LaserJet III.

The RISC-based MT908, using a TEC engine, started shipping at the end of January. Supplied with 1Mb of memory expandable to 5Mb, it is designed to handle up to 16,000 pages per month. It has four resident emulations including PCL Level 5, and the HPGL Level 2 plotter language. It also has 14 resident bitmapped fonts and eight scalable, rotatable ones. You can print in landscape and portrait on the same page, rotate text and graphics, and print in white on black.

A PostScript option has arrived for beta testing. When released it will sit under the motherboard, requiring no engineering to install. It will cost £499, but will require £145 worth of extra memory.

MT also says running costs will be cheaper than HP's because you don't have to replace the OHP drum every time you change the toner.

Toner from MT costs £26 for

3000 copies while a new drum (lasting 10,000 sheets) costs £80. A LaserJet III cartridge, with integral drum, costs £83 and lasts 4000 pages. On the face of it this works out 25% cheaper, but it takes no account of different post-warranty support costs.

The non-RISC HP LaserJet III, like the MT908, has a resolution enhancement facility built in, and 1Mb RAM expandable to 5Mb. It supports only PLC5 on board.

The HP LaserJet III costs £1749, the MT908 model prices in at £1599. Once on the street these prices are bound to be distorted. Hewlett Packard, (0344) 360000; Mannesmann Tally (0734) 788711.

Danny Bradbury

Dell's happy high-end family

Dell's high-end PC range is looking more distended than ever with the addition of yet another three machines.

The latest members of the company's 486 family are the SX-based P/20 and P/25, and the DX-based P/33. They are all small footprint ISA models, starting at £1495. The 486P range is similar to the 486D family which was launched by the company last autumn, but the latest models have been squeezed into a smaller chassis for the user who doesn't need as much expandability. Consequently, the P models have three expansion slots each, whereas the D series has six.

The latest machines are also upgradable, so that users can plug in a higher-speed chip when needed. A processor swap from a 486SX-25 to a 486DX-33 will cost £349, for example. Video components are also upgradable. With 512K of video memory, you have a 1024x768 resolution with 16 colours; an extra 512K means the system can support up to 256 colours in this resolution or 32,768 colours in VGA. Each system can be expanded from 1Mb up to 64Mb using SIMMs.

The Dell 486 product base now drops into four product categories — EISA towers and desktops, and ISA towers and desktops. There are six 486 and twelve 486SX models in all. Prices on the new P series range from £1449 for a 50Mb SX machine with 1Mb of RAM and colour monitor, to an 8Mb machine with a 320Mb hard disk, a colour VGA monitor and a 33MHz DX processor costing £3099.

The company has also announced 500Mb drives which should be shipping now and which will add an extra £300 to the prices. All machines currently take advantage of Dell's new minimum fixed storage capacity of 50Mb, which recently moved up from 40Mb.

Dell (0344) 860456.

Danny Bradbury





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Results — Win a Complete Office competition

The response to the PCW Win an Office Competition in the December 1991 was incredible. We'd tried to make our lives as easy as possible by insisting that you send in the original forms, spreading the competition over three issues and devising some devilishly cunning questions. Nearly 500 of you refused to be put off.

Many of the questions proved easy for most of those who entered, but one or two tripped many of you up:

Guy Kewney did indeed describe the Tandon floppy drive as sitting on top 'like a silly hat'. The two pairs of badge-engineered modems came from Tricom and Microcom and Racal/Milgo and Amber Logic. Rank Xerox was correctly identified as the publishing equipment supplier for the Barcelona Olympics, and most of you knew that ViewMax was the DRDOS 6 shell.

Dell's Austin, Texas origins didn't fool many (just Texas wasn't good enough), nor did the fact that the Psion Series 3 takes AA batteries.

We had a few odd answers to the Roland question. Yes, we know Roland is famous for its keyboards, but even if you include MIDI keyboards, describing them as peripherals is stretching things a bit. The answer we were looking for was plotters. Ross Quinlan is obviously more famous than he imagined, since virtually everybody knew that he'd produced the ID3 algorithm.

I'm sure both Borland and Zortech would love to take credit for the definition of C++, but the correct answer was Bjarne Stroustrup. Equally, some principles of fluid dynamics play a part in



the workings of a number of the prizes, but it's Bernoulli's principle that makes it to the badge of one of them.

The answer to the final question was that NEC was the first to introduce a colour printer, but it was the previous question that weeded out the final 40 from the 100 that had been right so far.

Prime candidate

Who was Prime Minister when the first widely used spreadsheet was introduced? If you knew that the spreadsheet was VisiCalc, you were on the trail. If you knew it was introduced in 1979, you were halfway there. It was introduced at the West Coast Computer Faire on the 11 May 1979, so Margaret Thatcher, not James Callaghan who had been defeated in the General Election eight days earlier, was at No 10.

Which only left the tie breaker. By

now we were beginning to wish we'd skipped the tie breaker and gone for a random draw. 40 entries to judge and, it has to be said, most of them pretty awful!

The endings to the sentence 'If I won a complete office I would...' range from the plain silly — 'tell EVERYBODY', 'prosper', 'have to buy a bigger house', 'not believe it', 'take a week off and play' and 'have a wild, orgiastic office party in order to celebrate' were among the silliest — to the creepy — 'order Personal Computer World for life' and 'rely on PCW more than ever to help me get the best out of personal computing'.

There were even a couple of attempts to include a handful of computer terms and products in the answer. The best of these was 'be DELLighted, NORTONLY to WINDOWS outTANDON computers, but ALDUS software as well! I B Mazed to C if it all fits in my BROTHER's SIERRA TURBO'; the worst, 'go all floppy with joy at winning such a cache of treasures'.

The winner, though, was always going to be a crawler and none of the winners summed it up as well as 'If I won a complete office I would have the ultimate environment to enjoy Personal Computer World - my own Personal Computer World' (though several people tried to make up for incorrect answers with stunningly fawning tie breakers).

The winner, then, of over £25,000 worth of computer and office equipment, is John Gwilliam of St Helens, Merseyside. Congratulations to John, and thanks to everyone else who took the trouble to enter.

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Doctor Wright doctored wrong!

Having just read Dr John G Wright's contribution on 'How to hide sensitive PC files' ('Readers' Tips', PCW/January), I fear that many of his students will regard his security techniques as an irresistible New Year challenge.

Hidden directories are easy to detect with, for example, Norton Utilities kept on a floppy; their contents could be scooped out in a matter of minutes.

Leaving an important PC with the keyboard unlocked is asking for trouble. What's to stop a villain introducing a virus via the A: drive? The chances of cracking a sensible password (that is, a random combination of letters and figures) are infinitesimal — less than one in a million for a four-character alphanumeric, one in 14 million if you make it case-sensitive.

FJP Crampton
Nottingham

Speedy current cuts phone bills

In response to Mr Decannierre's attack (Letters, December), may I come to the defence of Nick Beard over his statement that light and electricity travel at the same speed. Although it is true that the electrons which carry current move comparatively slowly — possibly the 30m/s Mr Decannierre quoted — the pulse of electricity they carry moves much faster. My studies of this for my final-year school physics project obtained results in the range $1-2 \times 10^8$ m/s or very close to the speed of light in a vacuum.

I am assured that the formula for calculating the speed of light through a substance — $1/ME$, where M and E are

the permeability and permittivity of the substance in question — is exactly the same as that for calculating the speed of a pulse of electricity.

Furthermore, one of my methods used in calculating the speed of an electric pulse involves creating a standing wave of potential difference. This reinforces Dr Beard's claim that electrons and photons behave in a similar manner.

If electricity travelled at 30m/s you would have a 5.5 hour time delay each way on a 600km phone call from London to Edinburgh, rendering conversation impossible. I rest my case.

Ian Brocklebank
Findhorn
Moray

Each-way bet

Steve Parsons ('Letters', January) states that a 3.5in HD disk can contain 1.4Mb as there are 1024K in 1Mb. I always thought that there were 1024 bytes in 1K and 1000K in 1Mb. This would give the 1.44Mb figure he disputes.

P Cogdell
Barry
South Glamorgan

Sadly, you can't switch between binary counting (in 1024s) and decimal counting (in thousands) just to make things work out the way you want to.

Perfect solution

Current software piracy laws are hard, unenforceable, and can be detrimental to the software houses themselves. How many users can afford the £1500 or more to set up their home computer with up-to-date software used in their offices? Most will make copies of the office software.

Software companies should allow staff to use office software at home. If employees were encouraged to install home computers, using free office software, more people would become computer literate leading to more use of computers in the workplace. Surely this can only boost the industry.

John Palmer
London E1

WordPerfect has already announced an enlightened policy similar to the one you suggest. Lotus, however, and most other suppliers still haven't woken up and smelled the coffee, I'm afraid.

Unix? What Unix?

With the advent of DOS 5.0, DRDOS 5.0, Windows, NT, PINK, OS2 v2.0 and even System 7, is it not true that there has never been and never will be a year of Unix?

Chris Moore
Preston

Sun is porting its Unix environment onto Intel processors and should have a robust multi-tasking environment available before NT or PINK. It is also worth noting that the ACE consortium will be offering Unix as well as NT, and that the IBM/Apple alliance is working on a new Unix as well as PINK. No, Unix may just outlive them all.

Is a 286 not worth buying?

I am in the process of selling my Atari ST to purchase a PC. As I am only 15 years old I am unable to add to the money I am likely to receive from the sale. I was therefore concerned by the proclamation in the standfirst to your SX Group Test (PCW, January) that the 'once-proud 286 is history'.

As you will appreciate, in the midst of the recession I am having difficulty in getting back a third of the £1000 I spent on my system over the years I have owned it. Is it really such a mistake to buy a 286 if that's all I can afford? My budget is likely to be around £700.

If a 286 offers a viable option, what machine would you suggest? My ideal specification is VGA graphics (monochrome if necessary), a 40Mb hard disk and 1Mb RAM. Expandability potential is also a necessity, but I doubt I'd require anything faster than 12MHz. I'm a patient soul...

Congratulations on retaining an unparalleled quality within your pages.
Joe Smithies

If you look through our ad pages, you should be able to find a 386SX with the RAM and hard disk you seek for around £700. And unlike a 286, you'll find that you can continue to use it for several years to come.

Steam over award for vapourware

I am writing about your 'Vapourware of the Year' award to WordPerfect for Windows (p292, January). As I am sure

you are aware WPWin was launched in the UK on 25th November and was available from dealers, at least in the London area, from the 27th. The launch had been scheduled several weeks in advance so the release of the product on that date was hardly a surprise. In fact it was released in the US on 7th November — perhaps at the very time your awards were being compiled.

I don't know when Microsoft's Word for Windows 2.0 was released in the UK but WPWin beat it by a very few days in the US. Certainly Word 2 could not have been out before it received your 'Product of the Year Award'. Granted you reviewed it in your December issue but that was, as you point out, a beta copy, and beta copies of WPWin had also been available for some time. Of course both products are now coming under criticism for being buggy, but that's another story.

PS. I don't know what the opposite of 'vapourware' is but your '1991 Awards' article surely qualifies. The Awards article is in the issue (and featured on the cover) but there is no mention of it on the contents page.

PPS. If you want vapourware how about Corel Draw 2.01 (also mentioned in your Awards)? I have been waiting for it since last spring and I understand that it finally started shipping in North America at the beginning of December — yes, really!

Andrew Biro
Software Evaluator
WordPerfect User Group of the UK

The reason that WordPerfect for Windows is vapourware and Microsoft Word for Windows 2.0 isn't (though they both shipped at roughly the same time) is that unlike Word, WPWin was promised (originally) at least nine months before it eventually shipped, and it was pretty massively hyped.

Forget the specs, I need help!

Help! Here am I with money jingling in my pocket, desperate to upgrade from my Amstrad PCW to something faster, and with more memory, but I can't seem to find the answers I need. I speak as a writer who wants to be able to run his work processor, do some work with DTP and to store the results on hard disk, but nowhere can I find what I seek — and I speak as a computer idiot.

The IBM clone world does not give me the impression of being interested in people like me, so while I found your Group Test of 45 386SX's to be excellent — what's inside the machine is

certainly fascinating — I really want to know which firms supply an excellent and comprehensive manual.

Multiplex, I note, offers a video, but I want something to hand, something that leads me gently from A to B. In the end I suspect I will buy an Apple. I am looking at a IIsi, although spec for spec and price for price it doesn't compare with the various IBM clones you describe. It does, however, make allowances for clients like myself, people who use and need computers, but whose understanding goes no further than the needs of their trade.

Raymond Berger
Exeter

Your tentative decision to go for a Mac is sound: though expensive, Macs are easy to use and very good at word processing and DTP. If you want to save some dosh, though, why not buy a cheap clone and one of the dozens of books available to help people like yourself? Clone manufacturers don't make expensive manuals because not everyone needs one and those who do can buy generic guides.

Unwanted files

A suggestion: articles telling us the purpose of all the various files that come with DOS and the latest application programs would be useful.

The newest packages take up far too much disk space and I am certain many files are unnecessary for the 'normal' operator. I need the advice of an expert 'gardener' before I can start weeding.

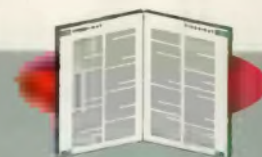
GA Henderson
Bridgwater
Somerset

Any news on System 7.0.1?

I've been using System 7 for some time now, and I pricked up my ears at the sound of System 7.0.1. After all, I was using version point-zero of an operating system, and that made me nervous. Nervous enough to want an upgrade that appeared to be available.

System 7 is not quite the nirvana you may think — although it's much more usable than System 6, the mortality count on my public-domain software was pretty high, on games even higher. The word processor I'm writing this on and most of my other applications (including ones the Compatibility Checker rates as OK) have a tendency to produce 'Type 1 errors'.

System 7 doesn't freeze as often as its predecessors, but that's offset by the



Hindsight

March 1980

'Clive Sinclair, the inventor of the pocket television... has done it at last. Exactly what he has done is to produce a personal micro with keyboard and TV interface and BASIC for under £80 in kit form, and I for one don't know how.'

Guy Kewney, Newsprint

March 1982

'Connoisseurs of false modesty will not be pleased by the outspoken bravado of Michael Kraftman, who has opened a micro shop called Bonsai in London, with the words: "Within 10 years, there will be a Bonsai microcomputer showroom in every major conurbation in this country."

Guy Kewney, Newsprint

March 1984

'As far as the enhanced model is concerned, I feel confident that, whatever the competition, it's going to be quite a success.'

Surya, PC Junior review

March 1986

'Typical of the new machines from Japan is the Toshiba Portable PC which comes with 512K of memory, a single 720K 3.5in floppy disk drive and a high-resolution (600 x 200 pixels) 80-character x 25-line LCD screen. At nine pounds (with built-in rechargeable batteries) the Toshiba is approximately three pounds lighter than its rivals and, with a price in the \$2000 range, somewhat cheaper.'

David Ahl, Yankee Doodles

March 1988

'My own ideas of what my next operating system should look like are as far removed from this leviathan as they are from the patronising heiroglyphics of the Macintosh... I do know that it is unlikely to come from IBM.'

Review of OS/2 1.0 Standard Edition

Readers' letters are welcome and should be sent to *Personal Computer World* Editorial, VNU House, 32-34 Broadwick Street, London W1A 2HG. All letters will be considered for publication unless they specifically state otherwise, and we reserve the right to cut or amend them for editing purposes. The Editor is not bound by the views expressed therein.

fact that it kills off applications before a freeze-up can occur. Would 7.01 improve this situation? I rang my local Apple Centre, which didn't know. The official Apple line is that System 7.01 exists merely to allow proper installation of the software on the new machines. The Apple Centre staff assured me that I'd gain nothing by upgrading to 7.01, as the two releases were virtually identical.

After reading around in computer magazines, I know otherwise. There are some significant differences between 7 and 7.01. The maths handling code has been rewritten so that calculations done with maths co-processors from SANE (the Standard Apple Numeric Environment set of maths routines) are blazingly fast compared to 7.0 or earlier releases — useful for speeding up CAD work or your fractal programs.

The System 7 memory management software has been rewritten to support RAM disks in addition to the virtual memory already present. And if the memory manager has been rewritten, there's a good chance that something has been done about the Type 1 errors.

So Apple, why the secrecy? Why can't I wander along to my local Apple Centre with a set of blank disks and

simply make a copy of the System, as has always been done in the past for minor upgrades? When is the next ready-to-go version of System 7 going to be released?

Lloyd Wood
Peterborough

Read our Apple story in the News section. You won't be changing your version number, but you will, effectively, be getting bugs fixed along with performance improvements.

Partitions are a thing of the past

My family will soon be acquiring a PC-compatible computer (probably a 33MHz 486DX), and since I shall be responsible for setting it up, I would be grateful if you could answer some queries. The system will have a 105Mb hard disk, and I gather it is common practice to partition hard disks into separate areas.

Having only previously used floppy disks and network filing systems this seems a remarkably crude way of organising files. What is the advantage of these partitions?

Secondly, I am a keen programmer. At school I have programmed a lot in BBC BASIC and have recently started using an ANSI C compiler on my school's Archimedes network, and have decided to get a C compiler for our PC. My problem is deciding which to buy. I would like it to be able to use the 486's built-in maths co-processor and be able to produce (or be able to be expanded to produce) Windows 3.0 code. At most I could afford about £100-120: I am only fourteen, and this is a pretty hefty part of my life savings!

Is there a significant threat from viruses if I exchange data with friends at school, use cover disks and shareware etc? Should we use any anti-virus program, and could you recommend a cheap one?

PS. When will Windows 3.1 be released, and will all Windows 3.0 software be compatible?

PPS. Thanks for your time and keep up the good work on the mag!

Sebastian Wills
Dulverton
Somerset

Don't bother making several partitions of your hard disk. You had to, once, because DOS couldn't handle parti-

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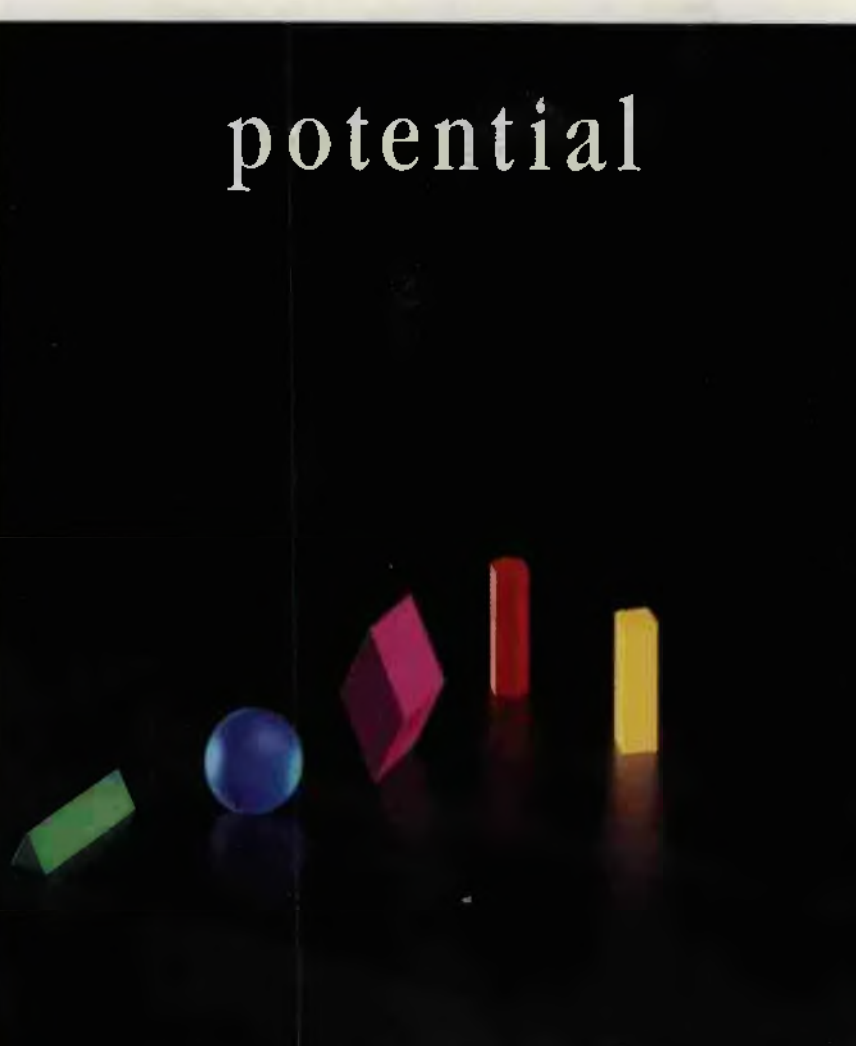
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potential



tions above 32Mb. Now it can (DOS 4.0 up can, that is). For a compiler, buy Turbo C++ (around £50). Once you get used to that, you can buy Turbo C++ for Windows. We aren't too worried about viruses ourselves. Microsoft says Windows 3.1 should ship in April, and should run everything that runs with 3.0. But we're not so sure, ourselves...

Silver dollars down the drain

I am not a computer expert and am concerned that suppliers appear to expect buyers to know their precise requirements and place an order, without wasting time with foolish questions.

I thought I had the answer when I joined the Amstrad User Group — one year's Silver Membership, for technical support, for only £44.95. On the 5th November I sent a fax to its Technical Department, identifying a problem. Despite trying to contact them on several occasions, including a fax to the Managing Director, I have still not received a reply (6th January), nor even an acknowledgement.

I should not have been surprised. In July I rang Amstrad for details of its

answering machine/fax. Three days later I phoned again. I am still waiting. I bought an alternative machine.

M Knobel-Forbes
Royston
Herts

Now let us praise helpful men

We so often read of poor customer support that I wanted to publicise the following. Several years ago, I purchased a network system for our BBCs from SJ Research of Cambridge. We recently had a problem with part of the system. Instead of taking the 'Oh your equipment is out of date... buy some new stuff' attitude of some firms, SJ worked hard with me to get our old system working.

Through some generosity on their part, I once again have a working system at very little cost to the College. They had sold the system, and they stood behind it honourably.

Tom Boyd
Head of Computing
Seaford College
Petworth
West Sussex

Odds bodkins!

I must confess to a full and complete agreement to the Argument so eloquently discussed by your astute Reader, Mr Parsons of Newton Abbot. He hath a fine understanding of the Nature of Language, and of how well it flows with Time to be understandable to folk of all generations.

Well do I appreciate his noting that words such as 'disk', 'program', 'font' amongst many others are but Alien Convolutions of the King's fine English. I have previously had occasion to chastise a Mr W Shakespeare of Stratford for his own incoherence in the spelling of his own Name. Thus I am sure you can appreciate my True Delight at the discovery of a fellow Soul.

Let us be as One Voice in our disquisition of those who would take pleasure in Spellings which be at Variance with the agreed Definitions and Presumptions of Oxford. Mayhap the combination of four Vilefication at these Intrusions will ensure their full and utter elimination.

Yours in faith,

W Toombs
Aylesbury

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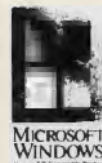
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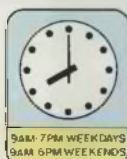
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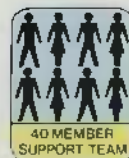
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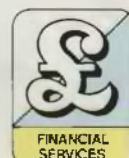


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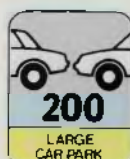


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Rupert Goodwins

When I started writing these columns, I was rather pleased with the idea of my face appearing in the magazine. Could fame and fortune be far away? Well, yes. I've only been stopped in the street once by someone who recognised me from the photograph above, and that was to complain that a promised article on flight simulators hadn't appeared. (I brought this up with the Editor, who told me that it had. Mystery reader, take note.) And anyway, looking at the photo I'm not so sure that anonymity isn't to be preferred.

Where I, and most other computer journalists, get more feedback is online, on conferencing systems and bulletin boards. One such virtual encounter happened last week, and it's fairly typical. My correspondent took it upon himself to vigorously attack the state of the UK computer magazine industry. We're all guilty of publishing inaccurate articles, deliberately keeping our readers in the dark and (worst sin of all) conspiring to keep the technical content of the publication at as low a level as we can manage.

The good old days

In vain I argued that we put as much detail in as we thought appropriate, and that many readers — a considerable majority — needed to know more prosaic information such as reliability and usability rather than the quality of the code structuring in the BIOS chips. In any case, what did he think of the articles I'd done on this and that? He hadn't read them. In fact, he'd not read anything much in the magazine for the past couple of years, it was so awful. What he wanted to see was a return to the good old days of the early 80s, when there were articles on programming, nice long listings and some really in-depth how-to series for those who

wanted to control fish tank heaters from their BBC Model A.

To tell the truth, there is something fishy here. The magazines of that era achieved some quite respectable circulation figures, and were read by people who were prepared to spend a long time battling with tape recorders, unbelievable limitations on memory and poor documentation in order to get something new and interesting out of their computers. You might think that today, now that you can buy a computer with VGA, hard disk and adequate RAM for the same price as a Beeb cost then, there would be more people dabbling with the delights of digital fiddling. Certainly, when I think of the months I spent tweaking BASIC programs on my 1K ZX81 I find it hard to imagine how much further I'd have got with even the smallest of hard disks and a 64K BASIC. Given that it's easier rather than harder, and the results can be so much more rewarding, where have all the hobbyists gone?

Nylon shirts

The same question was asked back in the early 80s, only the missing tribe then was the electronics buff, the people with solder-splash burns in their nylon shirts and home-brew doorbells that played half an hour of Mahler whenever the postman called. Magazines folded, clubs shut up shop; had some mysterious aliens popped down and purloined the lot? The best explanation I heard — and, after all, I was that buff — was that the home computer had arrived and suddenly it was just as much fun and twice as easy to program that than build yet another metal detector.

I rather think that the same thing has happened again. Instead of programming their pride and joys, and spending evenings poring over assembler handbooks, the hobbyists have moved on to playing with applications. The

modern micro is such a complicated system that considerable time can be spent tweaking this and fine-tuning that; indeed, I believe that Windows installation and optimisation is being proposed as a new sport for the next Olympics. Add to that the endless flow of shareware, freeware and ripped-off programs that cascades from cover-mount disks, online services and the friend in the Red Lion, and it's clear that even the more technical computer owner can expend as much time as they've got just trying things out, or getting the last spare byte out of DOS, or writing Serbian translation macros in Word.

Wasteful activities

I put this to my protagonist, who would have none of it. The magazines' job is to lead, he said; of course the great unwashed will squander their time on such wasteful activities if there's no hint from you lot that there can be more to it than that. He knew of newspapers — newspapers! — in the Far East that published pages of programs from their young readers; without this sort of support, he hinted darkly, we'd be selling the future of the country down the river. And all for the sake of page after page of SX reviews.

I have to say that I still don't believe a word of it. If PCW were to reinstate 'TJ's Workshop' (ask your Grandad), would the nation rise as one and take up its GW-BASIC files? Perhaps there's room for a new magazine to rally the faithful and preach the gospel of DIY hackery, but I wouldn't like to have to present the business plan to anyone. Yet my online adversary was resolute, and he also succeeded in gathering some support behind him; perhaps he's right. But I doubt it.

I had one last go at my truculent pal. If there was so much wrong with the magazines, why hadn't he had a go at the editors? Sent them letters, let them



know that they'd been getting it wrong. Ah, not his job, he replied. An Editor ought to know these things. That's what they're there for.

Unfortunately, telepathy doesn't work. Letters do, so if you're not too busy writing software to feed the piranhas and you think that there's something awry with this or any other magazine, write and say so. Otherwise you run the risk, next time you're whingeing on a bulletin board, of being attacked by a bearded computer journalist who's secretly rather miffed that nobody's accosted him and asked for his autograph yet.

Matthew May

On Tuesday 26 November last year, twenty-eight people arrived unannounced at the offices of Mirror Group Newspapers and The European, court order in hand, and proceeded to make a nine-hour inspection of five buildings. Surprisingly, this not inconsiderable posse had nothing to do with the serious fraud office nor irate pensioners wondering where their funds had vanished to.

In what turned out to be a classic piece of mistiming, it was a group representing the combined might of the Business Software Alliance and the Federation Against Software Theft using their now favourite and powerful weapon, the *anton pillar* court order that allows copyright holders to search without warning the offices of those they suspect of software piracy. A week later, and the problems of whether any personal computers at the Mirror Group were running the odd unofficial copy of Lotus 1-2-3 or Microsoft Windows paled into insignificance, as the serious fraud office moved in and hundreds of millions of pounds were discovered to be missing from the company's pension funds.

'This was our largest inspection anywhere in the world to date' said Bradford Smith, described as European counsel for the BSA and who insists that they are still pursuing the case. Describing what they found at the Mirror group as 'flagrant' copyright infringement, the alliance followed up in December with a writ against the London Borough of Greenwich following court order searches on seven buildings and claiming that copied software was found on virtually every one of the 35 personal computers examined.

'Although we prefer to rely on positive educational efforts, there clearly comes a time when we must move from words to action' said Fox Borgerhoff Mulder, European vice-president of the BSA, who is determined that companies should take the BSA and FAST's recent 'get tough' policy seriously.

Actually taking a company into the courtroom is rare, with out-of-court settlements often possible, though Mr Smith stresses this is not a cheap option as the guilty parties, apart from having to humble themselves in apologetic statements, also have to pay the full price of any pirated software, the cost of replacing it and the legal costs of both sides.

Widespread piracy

Piracy is clearly widespread — at least 2.5 million people in Britain do it, according to one Mori poll, while the total number of software packages that have been sold in Italy is apparently only half the number of personal computers sold. Copying software is all too easy, and who really wants to have to follow the example of Ford, who purchased 170 copies of a Novell networking package and threw 169 away just to make sure it could use the product legally.

One possible answer being suggested is electronic software distribution. The concept has a chequered history, as

during the days of the home computer boom a variety of crackpot ideas were hatched to try and sell games software electronically. These ranged from transmitting programs over telephone lines to juke box type arrangements in shops that would download a selected program onto a blank cassette or floppy disk when buyers pressed the right button. The dubious advantages cited for this particular system included a saving on storage space for the shops and never having to say sorry but the title you want is sold out.

Now the idea of ESD has returned but this time for use by business customers. IBM, for example, recently tested a system that could send software to customers by satellite, which, said the company, 'includes facilities to ensure that no-one will be able to receive software for which they do not have a licence'.

Automatic fixes

As well as transmitting software updates, IBM envisages that customers could receive automatic fixes for software errors and guaranteed delivery of any of the top 100 personal computer software products within 24 hours of an order being received. ESD over the phone is also being tried again by one company specifically pushing the idea that it will help companies stop pirate software spreading in their offices.

Electronic Software Distribution, which is confusingly the name of the company as well as the concept, is aiming to provide a selection of programs that can be downloaded from its mainframe onto any standard personal computer with a modem. Customers will also be able to electronically buy licences to use further copies but each will have an audit trail that links its use with the serial numbers of a user's system. Electronic dongles are also planned in order to protect the software from piracy.

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How willing software suppliers will be to provide their products to ESD remains to be seen, but one thing the company must ensure is that its mainframe has security similar to that of a bank. The possibility of hundreds of top software packages being available 'free' over a telephone line is likely to be seen as the next best thing to cash and will attract the most ingenious wiles of the hacking community.

David Morton

Unless you've been holidaying on Ganymede for the last eighteen months, you can hardly fail to have heard of the many benefits of object-oriented programming languages. Their merits, initially praised by the sort of evangelists whose opinions many of us take with a pinch of salt, are now widely accepted by those whose work belongs in the real world of problem solving rather than the halls of academe. However, while I can see that an object-oriented approach is the way to go for new developments, I don't yet understand just what we're supposed to do with those huge dinosaur programs that many of us are obliged to maintain, upgrade, or port to new hardware platforms.

Depending on the nature of the problem it solves, such a program will be many lines of COBOL, FORTRAN or another programming language with its roots in the fifties and sixties. Often the application will have been developed over a period of years, by many programmers and analysts, many of whom will have gone on to better things and whose thought processes may well be discernable only by examining the tangled web of source code.

Just how we take such a program and bring it into the modern world seems to me to be a problem that has no obvious solution. In my own case I've been asked in the recent past to port substan-

tial FORTRAN programs from a VAX minicomputer to a desktop machine. The problem here was that VAX FORTRAN has a rich selection of extensions over standard FORTRAN, and the programmer had, quite sensibly, made use of these extensions in his application.

In this case I'm afraid I cheated a little: since the client had not specified exactly which particular desktop machine he wished to use for the final system, I was able to specify a Macintosh. The Language Systems FORTRAN compiler for the Mac offers a remarkable degree of VAX FORTRAN compatibility, supporting almost all of the VAX extensions. As a result, the port of the main part of the code took less than a day, leaving me plenty of time to add support for the Mac's user interface, and turn a rather unfriendly VAX program into a nice, modern point and click application.

Had I been asked to port the same routine to Microsoft's Windows, things wouldn't have been so easy. Microsoft's Windows FORTRAN compiler, for example, doesn't support the Windows API — you can't write an entire Windows application in MS FORTRAN. The best you can do is to code the number crunching bits of the application into a Windows Dynamic Linked Library (.DLL) file, and then call those routines from a Windows application written in C or Pascal.

But in both these approaches, all I've done is to take an old application and patch it into a new environment. In neither case have I solved the fundamental problem: that we have a set of FORTRAN routines written by a long departed FORTRAN expert, and if we need to get into the guts of the program to the algorithms used, for example, we're no better off than before.

There are tools available which help to restructure code in the hope of making it easier to maintain. The splen-

didly named 'SPAG' from Polyhedron Software is one such product: it aims to translate 'spaghetti code' into its structured equivalent — a good step, but of course it's still FORTRAN. Even the readily available language translators whose purpose is to translate from FORTRAN to other programming languages — C is the most common target language — do nothing to address the problems associated with maintaining and upgrading the code. What you get out of such translators is just the C equivalent of the input code; more or less, the quality varies, and there are PD and commercial translators: if that was a mess, then what you get out is a mess, written in a different language.

Spare a thought, then, for the software team at the US National Radio Astronomy Observatory in Charlottesville, Virginia. Their 'Astronomical Image Processing System' (AIPS) has grown to around 600,000 lines of FORTRAN over the years (it was first written in the late 1970s) and has now reached the stage where it's almost impossible to keep up to date. When researchers developing new algorithms want to add them to the AIPS system, they're faced with a complex task, with important elements of the program scattered between many sub-routines.

Rebuilding from scratch

So the AIPS team intend to rebuild the software from scratch, using C++, in the hope that the resulting code will be easier to maintain and upgrade. The team of thirteen software specialists expect to finish the new version, already dubbed AIPS++, in under two years: a timescale which equates to a little over one hundred lines of code translated per man-day. While this rate of progress is quite reasonable when compared with the task of writing the code in the first place, the re-write still represents a huge investment.



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If the sheer cost of the operation weren't worrying enough, there are also doubts about the effectiveness of the finished program: FORTRAN compilers are well known for their efficient optimisation algorithms — they're much more effective than C++ compilers in this respect — and so the new, improved AIPS++ may well be significantly slower than the old version.

While a means of automating a conversion like this would be a boon to many of us, the chances of anyone being able to write one are pretty thin. The task of converting code intended to run on a single processor to code running on a number of parallel processors is much less complex, and yet the commercial conversion routines that try to do this are pretty ineffective without a lot of human intervention. While the world of objects might promise many benefits, some of us are going to have a hard time getting there.

Jack Schofield

Time doesn't like being beaten, as the Mad Hatter in *Alice in Wonderland* learned to his cost: it was always tea-time. Journalists don't have to beat time, just to beat deadlines, but the effect can be just as disorienting.

The problem is the production schedule. It can take a month or two to produce a magazine feature, and up to three months to get it into print. You have to start getting into the 'Christmas spirit' in about August. When everyone else is enjoying Christmas, you're wondering about the joys of spring.

Life has improved in the last 20 years, as computer typesetting and film (photo-lithography) have replaced metal type and 'blocks' (illustrations cut in metal and mounted on wood for printing). What used to take a couple of weeks is now done overnight; things that used to be 'sent out' are now done

'in house' almost instantly on office PCs or, more likely, Apple Macs.

An unfortunate fact of life, though it is one some journalists never learn, is that no publication can be produced all at once. It's nice to have 'late copy' that whizzes into print in the shortest possible time: it provides that vital 'up to date' feel. But if you're going to have 'late copy' you also need lots of 'early copy': the production schedule must spread the work over the month, the week, the day, or however long the publication takes to produce.

Even newspapers aren't created all at once. News pages must be produced daily but features pages are generally done on a weekly basis. You may be able to output pages after midnight for next-day delivery in the London area, but that doesn't mean you can output 30-odd pages after midnight, or get the results to Scotland. Instead you get features pages away in the afternoon, and use the late production capacity for things that matter: edition changes and 'breaking' stories.

Hostage to fortune

Obviously the reader is not meant to notice the difference: a publication should look like a seamless whole. Journalists therefore get into the habit of working for 'the Spring number' or 'Thursday's paper' or whatever, and enter the time-warp described at the start of this 'Diary'. But working like this, you become a hostage to fortune.

You can, for example, review 'last night's television' sitting in the office watching advance tapes supplied by the BBC or ITV. The story will be 'in page' before the programmes are broadcast, which is fine... until a football match goes into extra time and the TV programme you reviewed is dropped. Even a feature that is entirely correct when written can be overtaken by what's known as 'the course of events' — a revolution, a volcanic eruption, an

outbreak of salmonella poisoning, a company collapse or whatever.

Sod's Law ensures that something always turns up just too late to be included in whatever you write, whenever you write it. In last month's column, I used a few things from The Oxford Minidictionary of Quotations, part of the Oxford Writer's Shelf (see page 150, this issue). This is a TSR program that you can pop up over your word processor. Once that had gone, up popped Roalan International (0202 861512) with a copy of Quotemaster Plus (£75), an American program that can also be installed as a TSR.

Searching time

I thought I might find a Diary opener, so I searched on the word 'time'. Quotemaster didn't find Alice telling the Mad Hatter, 'I know I have to beat time when I learn music', which was no surprise. Nor did it offer two favourite bits of Shakespeare (Hamlet's 'The time is out of joint' and Richard II's 'I wasted time and now doth time waste me'), which was.

OWS offered a far better selection, including the Bible and Shakespeare. It had both the Hamlet and Richard II quotes, and a bit of Troilus and Cressida I'd forgotten ('Time hath, my lord, a wallet at his back, wherein he puts alms for oblivion'). It provided the source for 'Procrastination is the thief of time' (Edward Young's *The Complaint: Night Thoughts*). It also had AA Milne's Winnie-the-Pooh ('Time for a little something').

But OWS has no entries for journalism, not even Matthew Arnold's definition of it as 'literature in a hurry'. By contrast, Quotemaster has half a dozen, including that and two beauties from Oscar Wilde. I guess I'll have to use both programs.

Oh yes, this column was written over the Christmas and New Year break, in no hurry at all.

Amad

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Audio Trax

Mike Collins applauds Passport's Audio Trax as an introductory-level Midi sequencer for the Mac, but feels that the program hits a few bum notes and some practice is required.

Audio Trax is a unique new music program which will let you record both Midi data and digital audio data into a Macintosh without the need for expensive additional hardware. It runs on most Macs, but it does need about 4Mb of RAM and only works with System 6.0.7 or higher. Audio data is recorded direct to hard disk, and you need about 2Mb of disk space per minute for two audio tracks at 22kHz, so the audio for a five-minute song could use up to 12Mb.

Compromise

Opcode's similar Studio Vision program offers CD-quality audio plus Midi recording, but needs an expensive Audio Media or Sound Accelerator card. Audio Trax has to compromise to offer an audio feature without using an expensive card, and does this by using 8-bit digital resolution at a sampling frequency of 22kHz. CD-quality audio uses 16-bit resolution with a sampling rate of 44.1kHz, and offers a full frequency range of up to 20kHz — the limit of human hearing. A 22kHz sampling rate allows frequencies only up to about 11kHz to be recorded, which is a little less than a good cinema sound system (for instance).

The Mac IIsi and LC both have built-in microphones, otherwise you need to use the MacRecorder (made by Farallon) connected to the modem or printer port. You can replay audio via the Mac's internal speaker, but the quality is poor. The best way is to take the audio from the Mac's headphone socket to an external system. This could be a pair of small powered speakers, such as the popular Bose models sold for use with

the Mac, or via a mixer to any sound playback or recording equipment.

Audio Trax has up to 64 Midi tracks, plus two audio tracks. It has a control panel with tape recorder-like controls, including Play, Record, Pause, Stop, Rewind, and Fast-Forward. Once you have recorded audio to your hard disk, you can edit the two audio tracks on

sequencer editing commands are also available.

You can send external Midi Start, Stop, and Continue messages to Audio Trax, but it won't sync to external Midi clocks. It will respond to Midi Song Position Pointer messages, so you can achieve some kind of synchronisation with compatible equipment, although

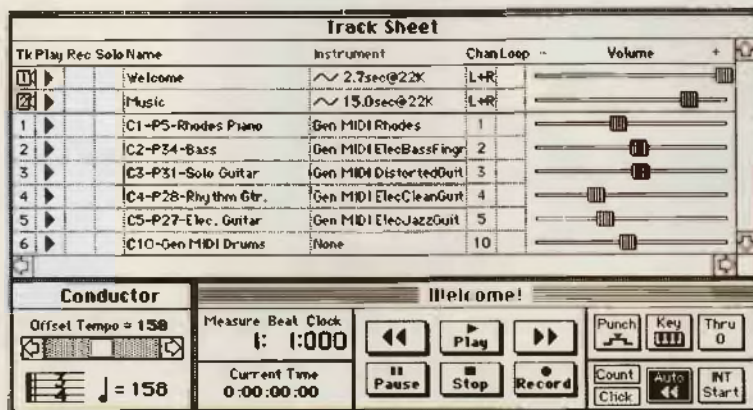
quite often you can only achieve 'wild sync' where you start two things playing at the same time and pray that they stay together for as long as you need them to. Obviously, in practice, this is more likely to work with short sections. The Song Position Pointers keep track of how far into a sequence you are in terms of 16th note increments. You can stop the sequence

some way in and then send a Continue message to restart play from that point, or from some other point identified by a Song Position Pointer.

Hypercard stacks

Two Hypercard stacks are included with Audio Trax. The Audio Controls stack sends Midi Start, Stop, and Continue messages to Audio Trax as it runs in the background under MultiFinder. You can use this stack as is, or export the Midi XCMDs to your own stacks. The other stack is a demo of how to use these controls to play a sequence (including Midi music and a voiceover) while a Hypercard presentation runs. A limitation here is that you can only use one track of audio, or your Hypercard animation may suffer unduly because of the demands made on the computer to replay the audio.

MacroMind Director is an obvious



screen using Cut, Copy, and Paste.

The sequencer features graphical 'piano-roll' step editing of Midi data, and has a Song Editor where you can Cut, Copy, Paste, and regionally alter tracks.

You can enter Midi data one step at a time using the mouse or a Midi keyboard, as an alternative to playing in from a Midi keyboard in real time. Audio Trax can also import and export standard Midi files. The Track Sheet Window lets you select a track to record or play back. Here you can name tracks, choose instruments, loop tracks, and set Midi channels and volume levels. The Tempo Map lets you set metre, tempo, and beat independently for each measure. The Change Menu has the usual 'quantisation' feature to let you round off the rhythm of the Midi tracks you have recorded to the nearest specified beat, and most other common

program to use in conjunction with Audio Trax, although the manual recommends that you run Director on one Mac synchronised via Midi to Audio Trax running on a second Mac, rather than running both programs under MultiFinder on one machine. Again, this is because Director needs as much processing power as possible to run animations smoothly.

Another usage suggested in the manual is with presentation packages like Persuasion and More. However, none of these can send Midi commands, so the only way to achieve any kind of synchronisation is to start the presentation running, perhaps waiting for a

mouse click to advance it, and then start Audio Trax running: it's possible, but I wouldn't recommend it!

Excellent introduction

As a Midi sequencer, Audio Trax is an excellent introductory-level program and is offered at a reasonable price. The audio quality is just sufficient for audio visual work or Mac presentations, but the lack of proper synchronisation capabilities will cause problems if you really do intend to synchronise with multimedia presentations. And why does Audio Trax only handle Midi via the Apple Midi Manager? Most Midi sequencers have their own Midi driv-

ers which are usually more efficient than the Apple ones, and also include Midi Manager compatibility.

Passport also sells one of the best soundfile editors for the Mac, called Alchemy. Unfortunately, you cannot open Audio Trax files into Alchemy, nor into Farallon's popular SoundEdit 8-bit audio editing software. This is just crazy!

Come on, Passport — get your act together, and you might make something of Audio Trax on the next release.

Audio Trax is distributed in the UK by MCMXCIX on 081-963 0663 and costs £179 + VAT.

Dupe 1.4

Dupe, a shareware Windows application, does just that — it finds duplicate files on a packed hard disk. Guy Swarbrick set it to work on his many copies of Flight Simulator 4...

It was 11 o'clock on a Tuesday night and I was faced with the unenthralling prospect of writing a review of XTree Gold 2.5. It isn't that I've got anything against XTree. Quite the contrary: I use it every day. But as I mentioned in 'Inside Out' in the January issue of PCW, there really isn't much new in version 2.5. And by the time I sat down to review the thing, even version 2.5 itself wasn't new.

So I decided to do something different. I've been quoted as saying that all public domain and shareware software is rubbish. That upsets me a little. What I said was, *most* public domain and shareware software is rubbish. There are thousands of programs out there, including a couple of dozen really good ones; and maybe a dozen outstanding ones. If you have an obscure hobby, you might be able to add a dozen more which, while they aren't very good in any real sense, perform the task for which they were designed and are truly peerless.

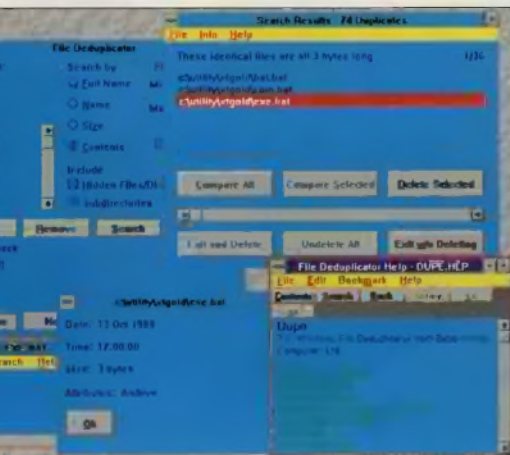
Self-discipline

Every now and then, I trawl the nation's bulletin boards and download the most popular recent additions to the shareware. Again, most of it is rubbish but some, like WinPost, WinGIF

and the Windows Zip Manager are well written and genuinely useful. Dupe 1.4 from Babbacombe Computers is useful in several rather surprising ways, especially for those of us with large hard disk drives and little self discipline.

I can remember a time when I had a 10Mb hard disk and couldn't realisti-

caly see myself filling it. Once full (after about six months) I moved on to a succession of machines with twice that capacity. There wasn't much point in having more, DOS wouldn't support it. Amazingly, I was still using a 20Mb drive, in a portable, over five years later.



cally see myself filling it. Once full (after about six months) I moved on to a succession of machines with twice that capacity. There wasn't much point in having more, DOS wouldn't support it. Amazingly, I was still using a 20Mb drive, in a portable, over five years later.

My desktop file requirements exceeded 20Mb long ago. In the recent past I have had half a dozen different

PCs with drives ranging from 80 to 150Mb. Strange thing is, they all seemed to hold roughly the same amount.

At the moment, I'm struggling on with a 300Mb drive which I filled within a couple of weeks. OK, I have software on there which I hardly ever use, but I can't face the prospect of reinstalling every couple of months. However, my comment about the 80-150Mb drives hints at another solution to the problem. Pruning the real dross from the DOS tree and cutting the size of my Windows swap file from 40Mb to 20Mb freed up around 40Mb, but, it turned out, there was 30Mb more waiting to be claimed.

Little utilities

Over the years, you come across little utilities: Where Is? programs, Software Reboot programs, Text Editors. You put them somewhere that seemed quite sensible at the time and, thanks to your enormous path statement, they always work. You take them for granted. You forget about them.

You run Dupe. As its name suggests, Dupe finds duplicate files. It's a Windows application that works on a number of levels. You can get it to find all the files that have the same name, or the files that are the same length, or both. You can even get it to compare every byte of every file.

Of course, it doesn't compare every file with every other file — life's too short. There's no point comparing files of different lengths, for a start. And, it's quicker to calculate a checksum on the contents of each file and compare checksums than to compare every file. Once you have a list of matching checksums, then you can compare byte for byte.

On a full, 300Mb hard disk, this full de-duping process takes a couple of minutes (the 33MHz 486 attached to the drive helps) and the results are quite surprising. My hard disk contained three copies of Microsoft's Flight Simulator 4, in various states of embellishment. I suspected a lot of duplicates and I wasn't disappointed. I also have recent versions of Borland's C++, Turbo Pascal and Turbo Pascal for Windows. Again, I wasn't surprised to see duplicated files.

The incredible thing was the files

that were apparently completely different but turned out to be exactly the same. Windows 3.1, for example, comes with a file called LMOUSE.DRV and another called WMOUSE.DLL. Or rather, it comes with a file called LMOUSE.DRV and WMOUSE.DLL. Why? Search me.

Frustration

This is one of the frustrating things about Dupe. It isn't the author's fault, I know, but the thought that there are a hatful of duplicated files on my hard disk that I can't remove because applications might look for both names at different times bothers me.

Dupe doesn't know, doesn't care. It handles a copy of WHERE.COM in the DOS, UTILITY and TOOLS directories the same way it handles the fact that PKARC and PKPAK and all their associated files are identical. It displays the identical files (574 groups (mostly pairs)

of them, in my case) by size and gives you the option to look at them to make sure they really are the same. It does that using Notepad, by default, so big or non-ASCII files may cause problems.

Once you're sure, you select the files and click on Delete. When you've finished looking at all the files, you choose 'Exit and Delete' and you're given a list of the files selected. If you're happy, they're gone.

My hard disk? With the removal of the two duplicate Flight Simulator 4 directories (which, incidentally, I deleted with XTree Gold version 2.5 because it was easier than selecting the duplicate files individually) and a whole stack of lost and duplicated utilities, I got back 27Mb. Not bad for quarter of an hour's work.

For further details, contact Trevor Prinn as tprinn@cix or on Compuserve 100016,2726.

GXA graphics card

Chip makers have spotted the large market for dedicated hardware GUI accelerators, and GainTEC's GXA is the first card to exploit the new processors. Dan O'Brien explains.

It was SuperVGA support that won me over to Windows. All those tiny icons and that broad canvas of 1024 x 768 were just too reminiscent of a Sun workstation to pass up. Of course, having bought it, one discovered what wasn't so sunny: the speed that large platters of Windows took. Applications zoomed to full size on a 1024 x 768 screen can take twice as long again to redraw themselves than on standard VGA. And if you wish to take advantage of any 256-colour modes your SVGA has handy, you can double that figure again. It's not as bad as it sounds, but even updates of the SVGA desktop, or gleaming white expanses of empty window, can be seen visibly creeping across the screen on my machine. Not intolerable, but certainly distracting.

It's the bottleneck of the slow, 16-bit AT bus that does it. GUI operations require a lot of movements to and within VGA memory; each of those words has to pass through from the processor to the card via that. The obvious (and

inevitable) solution is to junk history, and go for the wider data width and DMA bursts of MCA and EISA. Unfortunately, Windows poses the problem



rather sooner than these future standards solve them.

Timely cure

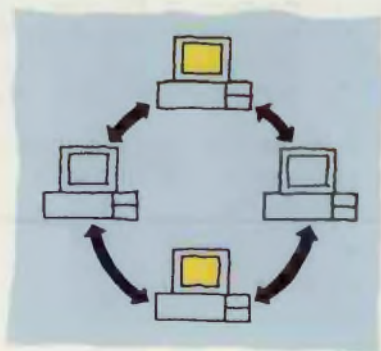
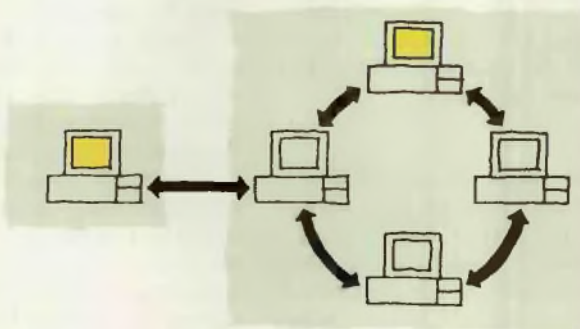
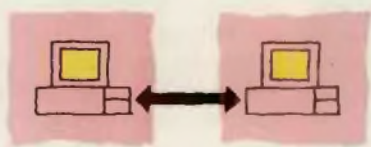
A more timely cure is to pass some of the load of GUI drawing over to a co-processor on the card itself. This allows the stream of data to be replaced by a few commands (draw line, move area, fill with colour) and less data. Before Windows 3.0, this remedy had restricted

application. Like their mathematical counterparts, co-processors could only take advantage of programs written with them in mind; ignorant applications didn't feel the benefit. It was a solution suited to minority markets like CAD and 24-bit graphics packages, and the prices reflected that. Price tags for the three main designs — CADdish 8514/A, the arty TIGA, and the GUI XGA — glow with digits.

As it happens, though, Windows laps up co-processor cards. Great portions of CPU time normally spent dumbly shifting data within screen memory, drawing rectangles of simple pattern and colour, scratching out horizontal and vertical lines and other repetitive actions can reasonably be fobbed off to a co-processor. Even the mouse cursor can become a hardware sprite. All applications can take advantage of the hardware. And the speed difference is available even on slow bus machines.

A number of chip manufacturers have spotted the large market for dedi-

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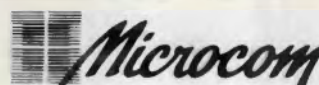
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cated hardware GUI accelerators, and the GainTEC GXA is the first card to exploit the new co-processors. In fact, the whole product reeks of youth and entrepreneurial spirit. All three companies involved are new to the market even if the names behind them are not. The co-processor is the 86C911, the first product of S3, a VLSI design company formed by two of the founders of Chips & Technologies. GainTEC, manufacturer of the ISA board and firmware, spent its time prior to the GXA crafting graphics hardware for textile designers. Scene Double, the UK distributor, used to be a one-product company selling a two-monitor VGA. The big boys — Tseng, Genoa, Orchid — aren't far behind, but for the moment, GXA's sleek start-ups have the lead.

Novelty

Such novelty doesn't count entirely in the card's favour. It summarily refused to work in the first PC I tried it on, a Solidisk 386SX based on an AMD 25MHz processor. Scene Double admitted problems with some motherboards, but indicated that they were in the BIOS rather than the board and would shortly be overcome. Operation on the fall-back, a 16MHz 386SX, seemed fine, but my faith in the GXA was already shaken. They may be teething, but they're still problems.

The package comes with drivers for Windows, Cadvance, AutoCAD and

Microstation, with an 8514/A emulator available as a TSR. Resolutions supported on the 1Mb version are all the standard ones up to VGA, plus 16 and 256-colour modes of 800 x 600 and 1024 x 768. There is also provisional support (I didn't have a sexy enough monitor to test it) for 16-colour 1280 x 960. The board will support a Sierra RAMDAC, should you have one handy, which can be fitted to provide 32768 colours; drivers will be available shortly.

Running a few test programs through the machine and comparing them with the Genoa card provided with the PC portrayed GXA in a suitably fetching light. Its standard VGA modes sneaked only slightly ahead of the suite of 'benchmarks' (and I use that word very unwisely here), showing around 10% improvement on DOS applications and Windows under standard VGA drivers.

Under its own drivers the GXA romped home, scoring increases at worst just under twice as fast, and at best (on a program devoted to drawing squares and blitting them around the screen) around five times as speedy.

Benchmarking video operations is a murky business, and I won't pretend these figures have any relevance apart from showing that GXA is doing something right. Subjectively, but possibly more accurately, the chief boon of GXA is in scrolling areas (file selectors become NeXT-like, with file lists smoothly scrolling past) and text display (there's

a sharp increase in the speed of terminal and spreadsheet software). Generally, SVGA Windows becomes inhabitable.

Sweetening the deal

Scene Double is clearly pitching this as an end-user product as well as for feature-greedy OEMs. Call me cautious, but I'm not as yet convinced that the product is stable enough to drop on eager users. The price is high for casual purchasers (although still half the price of the nearest competitors, the TIGA boards — and remember, GXA includes VGA and below, which many TIGA systems do not), so to sweeten the deal, Scene Double is throwing in Cameo Paint and Cameo Image, two graphics packages from Noble Campion. Versions adapted for the GXA didn't arrive in time for this review, but I've used the VGA versions and they're impressive: they include such rare tricks as spot separation, fax reading, JPEG compression, and outline detection.

This is an impressive, cutting edge product, designed by people who are clearly ahead of their fields, but perhaps at the expense of smooth edges to the product. If you're a dyed-in-the-wool technology buff, snap this up now. Otherwise, I'd wait for the whittling effect of its imminent competition.

The GXA card costs £345 from Scene Double on 081-958 3639.

Windows Draw!

Windows Draw!, Micrografx' entry-level art package, is distinguished by strong text manipulation and special effects. Helen Johnstone was proud of her efforts with it.

Micrografx claims that its first Windows application was written as long ago as 1984. That's a few years before Windows 3.0 reached the shops, but whether you regard that as a sharp move or not, there is no denying that Micrografx is an experienced Windows developer.

Designer and Charisma, the Micrografx art and design packages for the professional, were written specifically for the Windows platform and are both popular products. In contrast, Windows Draw! is an art package for the non-specialist. It is billed on the packaging as 'fast, fun and friendly', but it is more than just a cheap and

cheerful response to the growing interest in art software. Far from being amateurish, work created with Windows Draw! can be done to the precise and professional standards of most business users.

Accurate images

Draw! is an object-oriented art and design package, which means that the designs are built using lines and shapes as components, rather than the individual pixels of the display. The package is slanted more towards the graphic designer than the budding artist, with several features for ensuring images are placed accurately on the page. The de-

fault screen contains a page layout and surrounding work area, as in DTP software, with a 1cm dotted grid over the page and rulers along two sides. To ensure accuracy when figures are being edited, a status box in the top right-hand corner shows the position of the cursor to the nearest 0.1cm, or details such as the degree of rotation or angle of slant. With a zoom feature, giving up to 200% magnification for detailed work, the results need never be sloppy.

Another clear sign that Windows Draw! is weightier than the marketing suggests is the hardware it requires. Micrografx recommends a 286-class or faster computer, a VGA display, DOS

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For B model ADD £75

SVGA: Super VGA Colour (14" tube)

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3.1 or higher, Windows 3.0, of course, and at least 2Mb of RAM. To hold the program and a selection of the 2600-odd clip art images, a 20Mb hard disk is considered the minimum and 40Mb a reasonable size.

Running total

During installation Windows Draw! keeps an eye on the disk space available, and customising the installation minimises the space it occupies. The clip art library, which is installed separately from the basic core of the program, allows files to be selected individually and gives a running total of the disk space needed against the space available. New files can be added quickly and easily, or old ones removed, but unfortunately the installation disks are anonymously numbered from 1 to 10 so the clip art cannot be accessed from the floppy disks.

Windows Draw! works within a typical Windows screen, with a menu bar along the top and a colour palette and toolbox on the left-hand side. The

toolbox holds four tools for selecting editing operations — drawing, dealing with text, alternative screen views and adding colour, each with their own submenus.

The drawing tool covers the standard operations for creating lines, ellipses, square- or round-cornered rectangles, and polygons. Draw! then allows the line type or width to be changed and ends, such as arrowheads, to be added. Using the colour tool, colour is added to fill the figures, or as a background or outline. Line and grid patterns can be placed onto the colour which, when used in small quantities, can give the effect of shadow or change the tone of a colour.

Special effects

What sets Windows Draw! apart from many other entry-level drawing packages are the special effects. Figures can be rotated, stretched or completely reshaped easily, and flipped, aligned or duplicated using the pull-down menus. The handles, or anchor points, that

appear on a selected object for moving and resizing can be added or removed to allow fine control of the editing functions.

Windows Draw! is also strong on text manipulation. Files can be imported from most word processors or text added directly to the page, where it appears in WYSIWYG form. As the text is created, it appears in draft in a box at the top of the

screen, at a size large enough to read and edit. As well as justifying and formatting the text, Draw! can fit the words to a curve and use many of the colouring and re-shaping effects on them, as if they were graphical objects.

The way Draw! deals with clip art is impressive, too. The cataloging feature gives a simple way to locate an image and offers a chance to preview the image before selecting it. Once selected, a wide range of methods are available for disguising the fact that it is clip art. As well as the special effects that can be performed on any object, certain images allow the user to break apart the image, using an Ungroup facility, and edit the parts separately.

The special effects of Windows Draw! make it a fun package to use. After a little practice (more than the hour Micrografx suggests in the literature) my designs were beginning to look presentable, if simple. With a little more practice, I would expect to start producing work I could be proud of.

Recommended

The only weakness of the package is the colour handling. Only the selectable areas can be filled with colour and freehand shading is not possible in the same way as it is with Windows' own Paintbrush. Despite that, it is a program I would recommend to any non-graphic designers engaged in occasional graphic design work, or anyone with an interest in the subject. Obviously it is not up to the same professional standards as packages like Designer and Charisma, but for the price, it's very good value.

Windows Draw! costs £149 from Micrografx on (0483) 747526.



Oxford Writer's Shelf

The Oxford Writer's Shelf is a set of classic OUP reference books on disk that aims to help you get your language right. Wendy M Grossman put it to good use.

Most word processors these days have a spellchecker and a thesaurus; a few, like WordStar for Windows, even have grammar checking. Now, Oxford University Press has released a software version of some of its classic reference books to add to the standard tools.

The package includes: the Oxford Dictionary for Writers and Editors; the Oxford Minidictionary; the Oxford

Miniguide to English Usage; and the Oxford Minidictionary of Quotations, plus a 46-page A5 size manual. You must have 5Mb free on your hard disk for the (straightforward) installation routine; the files themselves once installed take up 4Mb.

The package runs as a pop-up utility. A set of three utilities allows you to choose your own hotkey, change the

screen colours, and control the speed of text transfer. Users of character-based word processors should have no problem getting the Writer's Shelf to run. Windows users will have to do some configuring; no help on that score is offered in the manual.

Once you've got the program installed, you load it by typing ORS at the DOS command; thereafter you call it

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For B model ADD £75

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up by hitting the hotkey you've selected. Calling the program brings up a small window in the centre of your screen with menu bars at top and bottom and the contents page of one of the four reference books displayed in between. From the top menu you can choose which book you want to consult, set or remove a bookmark, or look up conversions between metric and imperial measurements — weights, measures, distances, temperatures, and Roman numerals. An Options menu lets you choose which book comes up on screen as a default. Be careful of the File menu: Quit gets you out of the Oxford program; Remove unloads it completely.

Table of contents

The table of contents in the initial display comes from the default book and is typically quite short.

The Minidictionary list, for example, has six items: abbreviations, proprietary terms, the Minidictionary itself, independent countries, and chemical elements. A small diamond next to each of these items indicates that if you press ENTER you can jump directly to an alphabetical listing of that topic. That's where the lower menu bar comes in.

Once you've got the beginning of the alphabetical display in front of you, the Search option allows you to type in the word you're looking for (or the first few letters of the word you're looking for if you're not sure of the spelling) and the Writer's Shelf will jump directly to it. The search utility is fast and conven-

ient; however, Oxford could have done a few small things to make it more so. The Search field doesn't automatically empty itself if you start to type; you have to delete the old entry before inserting the new one. Similarly, you can't just hit 'S' and have lists scroll to

them), and highlight the one you want by pressing the shift and arrow keys together. Then hit ALT-E for Export, and it types itself in: 'Walk! Not bloody likely. I am going in a taxi.' (How many times have you longed to quote that and been unsure of the punctuation?)

The Usage book is there to answer questions. The grammar section tells you, for example, that the gerund (a verbal noun, like 'going') takes the possessive, as in 'She didn't like his going to the party'. There are also sections on vocabulary, pronunciation, word formation, punctuation, and even clichés.

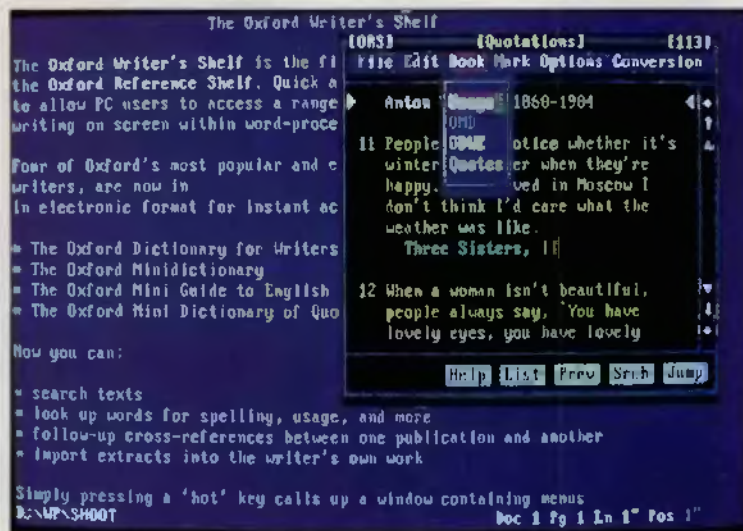
The Writer's Shelf won't proofread or check your documents for you; it's an enhanced, computerised set of reference books on disk, not a program in itself, so it won't help illiterate slob who think their English is perfect.

It will, however, appeal to those who aren't sure and want to get their language right.

Great companion

The Writer's Shelf is not going to completely replace all books — there just isn't enough disk space to include the entire OED (although this is now available on CD-ROM for some £500). But it's a nicely designed fast-access system with the great advantage of portability and accessibility: it's a great notebook companion.

The Oxford Writer's Shelf is published by Oxford Press on (0865) 56767 and costs £75.



the beginning of the 'S' entries: you have to use the search facility. The program supports a mouse, but it's easier to use the keyboard when you're already typing in text anyway.

Once you've got your entry, exporting it into the text you're writing is simple — particularly valuable for inserting one of the 4000 quotations included in the package. To call up one of George Bernard Shaw's better-known comments from *Pygmalion*, first call up the program. Hit ALT-B for the Books menu and choose Quotations. Choose the Authors listing from the book's contents page. Type ALT-S and enter Shaw in the search field. Scroll through the quotations (slowly, so as to savour

PC-Kwik Power Pak

Multisoft's PC-Kwik Power Pak compilation contains useful enhancements designed to make MSDOS machines easier to live with. Frank Leonhardt made the most of it.

Multisoft, publisher of the well known PC-Kwik disk caching program, and various other utilities which should have been supplied as part of MSDOS in the first place, has released a compilation of all its latest goodies and named it the Power Pak. The box says it will optimise every aspect of your PC, mak-

ing the whole lot seem faster.

As well as PC-Kwik, there is a RAM disk device driver, a keyboard accelerator, an improved screen driver and a print spooler. These utilities are designed to work together as a set, dynamically sharing memory with the cache program. In effect, PC-Kwik acts

as a memory manager for the rest.

Power Pak is supplied on a single 3.5in or two 5.25in low-density disks with an installation program to unpack and copy the contents onto a hard disk, modifying the configuration files for you. Unfortunately it assumes that you will want everything loaded each time

you boot, but a few moments with your favourite text editor will quickly suppress this over-eagerness. Power Pak takes up around 700K of disk space, though you can easily delete anything you don't need. For optimising software this still seems rather a large amount of code!

Cache

The greatest benefit will probably be gained from the use of the disk cache, PC-Kwik itself. The degree to which this improves your disk's performance will depend a great deal on the type of disk used, the amount of RAM turned over to caching, the speed of the processor and your usage pattern.

Users of a word processor or spreadsheet, who continually load and save a few relatively small files, will derive great benefit from a few hundred kilobytes of cache. A couple of megabytes are needed before something like Windows can be made to run smoothly, though even a small cache can help. With an efficient disk caching system, and PC-Kwik seems to fit that category, it is not unreasonable to expect a 70-80% gain in performance over a non-cached drive with everyday use.

To install PC-Kwik, simply type its name from the DOS prompt. In common with all the programs in the package it will load into high memory when this is possible, thus preserving the TPA for DOS applications. There are almost 40 command line options available to control things such as memory usage, buffer sharing, caching algorithms and so on. Deciding on the best combination can be a little tricky. The software seems to choose sensible defaults, which is just as well.

Garbage

All the Multisoft utilities print a large blue and white sign-on banner announcing that the company owns the copyright, the software is installed, and which of the many options it has selected on your behalf. Enabling the Power Pak results in several screenfuls of such garbage shooting past your eyes — hardly useful, but at least redirecting it to NUL spares you the spectacle.

Multisoft had added support for Windows 3.0, and PC-Kwik seems to do a far better job of caching than Microsoft's SMARTDRV, the cache supplied with Windows. A small Windows application shows the cache status and allows you to enable it while Windows is running.

I had some problems trying to use QEMM, PC-Kwik and Windows together ('problems' meaning Windows wouldn't run). In a situation like this it

is impossible to know what is at fault. Whatever the cause, I have so far been unable to resolve it.

PC-Kwik does work with SuperStor and Stacker, the disk compression utilities. It won't cache the data in its uncompressed state because it operates at a level closer to the disk, but the speed increase is still just as useful.

A RAM disk program is included which works as well as any other RAM disk. Its advantage over RAMDRIVE.SYS, as supplied with DOS, is that it doesn't require any of the 640K memory of DOS to operate. Instead it shares RAM with PC-Kwik when it needs it, and loads into upper memory.

The new keyboard driver gives you control over such things as the auto-repeat rate (including an accelerating mode). The most useful feature must be the DOS command recaller, ReDOS, which allows you to scroll back through a list of earlier commands, edit them if necessary and send them to DOS. This activity takes place in a pop-up window and works rather well. Strangely, no macro recording facility has been implemented.

The screen accelerator made no no-

ticeable difference on the machines I tested it on, but the facility to scroll back to lines lost from the top of the screen could be useful.

Power Pak contains a number of useful enhancements for MSDOS users which make their computers easier to live with. I would not describe anything in the package as indispensable or revolutionary but most of it is worth having if you use DOS.

Other sources

Windows users will probably only find a use for PC-Kwik, which is available separately. Equivalent products are available from other sources, notably Central Point Software whose PC-Cache program is just as good as Multisoft's. The DOSKEY utility of MSDOS 5 performs the same function as ReDOS, though isn't as slick.

If you use DOS applications and do not have utilities equivalent to those supplied in Power Pak, you will probably find it useful; just don't expect it to turn your PC into something it isn't.

Power Pak costs £79 from Opensoft on 081-343 9588.

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Rudy Rucker's Cellular Automata Laboratory

This suite of programs could teach you a great deal about that intriguing computational paradigm, Cellular Automata. Nick Beard assesses their practical importance.

Cellular automata, dynamical systems in which time and space are discrete, were first 'invented' (or perhaps discovered?) by John von Neumann and Stanislaw Ulam soon after the first developments in digital computing. The basic principle is simple enough: cellular automata (CAs) are made up of 'grids' of automata (think of them as lots of simple automatic machines, each in their own cell), each able to be in one of a number of states. Each cell checks the state of its neighbours, and based on them, decides what its next state should be. They all do this together, in parallel, and at each tick of the clock they make a decision.

Not long after von Neumann and Ulam's first work, John Horton Conway developed a CA system called *The Game of Life* (see 'The Logic of Life', *PCW* September 1991). This attracted enormous academic interest, and in 1974, *Time* magazine covered the Life phenomenon. 'Millions of dollars of valuable computer time may have already been wasted by the game's growing hordes of fanatics' the article said. Wasted? Some people have no imagination.

Practical importance

CAs are Turing machine equivalent, which means that in principle, any effectively computable problem can be solved by a CA. (This does not mean that it makes sense to try to use CAs to construct word processing systems; simply that it could be done.) Their practical importance is that they offer opportunities to exploit massively parallel computers (see 'Frontiers', this issue).

Rudy Rucker, co-author of this package, includes in the opening pages of its manual the prophecy that within five years we will be unlikely to watch TV for more than an hour without seeing some CA-based effects. Rucker also sees deepersignificance in them, as do many others, including CA expert Steven Wolfram, Editor of the *Complex Sys-*

tems and architect of Mathematica. Rucker's book *Mind Tools* (Penguin, 1988) closes with these lines: 'So what is reality, one more time? An incompressible computation by a fractal CA of inconceivable dimensions. And where is this huge computation taking place? Everywhere; it's what we're made of.' Heavy stuff: and so with technical



and philosophical justifications for learning about CAs, Rucker's CA Lab is a good package to spend time with.

It comprises two suites of programs: RC, Rudy's Cellular Automata, which was written by Rucker; and CA, the Cellular Automata Lab, written by John Walker. Walker is one of the founders of Autodesk, producer of Animator and AutoCAD, to which Rucker is a consultant when not being a Professor of Mathematics or writing science fiction. RC is described as 'a right brain, hands on' program, where the screen bubbles with CA activity, controlled interactively from the keyboard. CA is a programmable, high-resolution CA system, also referred to as 'a left brain analytical program'. Here you pick patterns, fire up the interaction (update) rules, and let the lab run.

Seething soup of colour

RC produces a seething soup of colour (if your screen can handle it) which arises from the interaction of the cells in the lattice. There are some blocks of 'fixed state' cells, which can be moved around the lattice prompting various responses to the cells touched on the

way. This will run on the most basic of systems, and includes a driver called 'clunker' for the oldest and most decrepit CGA monitors. It will also run in text mode on non-graphics machines.

CA needs a graphics card, at least CGA. If you have a VGA, the package will make use of it. Hardware requirements are generally modest, and the system will run from floppies. If you use a hard disk, it consumes around 1Mb of space.

Effective installation

The program comes on four big or two small floppies, and includes an effective installation routine which creates an appropriate directory structure and copies everything over. There are a number of demo runs, including a couple of animated 3D CAs produced under an Autodesk shareware program called AutoFlix.

The instruction manual is well written, and in addition to the software introduction and detailed instructions (which are very effective) there is a historical chapter, plus details of the implications of CAs and guidance on producing your own CA rules in a number of languages. The program supports C, BASIC, Pascal, and assembler.

In addition to the ability to produce screendumps for reloading later, a utility program is included which converts images to PostScript format. This can either package them as encapsulated PostScript files complete with printer instructions so you can just COPY *.PS PRN, or as 'raw' PS files requiring further handling elsewhere. This works, and I have already used it to generate some oddly-headed notepaper.

This is an intriguing and fun package which can teach you a great deal about this important computational paradigm. Schools and computing departments should all have it, as should anyone else interested in computing.

Rudy Rucker's Cellular Automata Laboratory costs £49.95 + VAT from Autodesk on (0483) 300077.

Timetable of History — Science and Innovation

With its moving video, voiceovers and special effects, Software Toolworks' Timetable of History — Science and Innovation makes learning fun. Mat Beard was entertained.

CD-ROM drives have been around for about seven years now, but it is only recently that they have become reasonably affordable. With an increasing number of people owning the hardware it became apparent that there was a shortage of software. Sure, you can get lots of interesting information on a wide range of topics, such as *'Ceramic Abstracts, 1976-Present'* or *'Resource Management Continuous Speech Database Speaker-Dependent Corpus'*, but it's rather obscure and it isn't exactly fun.

There are now a number of less serious CDs available. Games such as *Wing Commander* are also produced on CD format to save hard-disk space, or a selection of older games can be bundled onto one CD. One company that produces a lot of these 'fun' CDs is Software Toolworks and one of its more recent offerings is the *Timetable of History — Science and Innovation*. It's far from a game; it contains a vast amount of information on all important inventions, discoveries and events from the birth of the universe, through the building of Stonehenge to genetic engineering. That may not sound too entertaining, but when you combine all that text with moving video, voiceovers and sound effects, using it is a lot more interesting than the *Encyclopedia Britannica*.

Fly me to the moon

The opening screen gives you the choice of going through the demo or diving straight in. The demo is entertaining: a female American voice guides you through the use of the search system and the functions of the eight 'multimedia' icons that appear at the right of the screen. It then goes on to show you the launching of Apollo 11, the rocket that carried Neil Armstrong and Buzz Aldrin to the moon on 16 July 1969.

When the demo has finished, you are perfectly placed to look up information on any topic you can think of. You select a keyword from the long alphabetical list, either by scrolling up or down to the desired word, or by using the alphabet keys which take you to a particular letter. Once you have se-

lected a keyword, a list of stories is displayed that contains that word, in chronological order. If the list is too long, it can be reduced by adding another word to search for. If you find a story that looks interesting, simply clicking on it will display all the information in a scrollable window. All the words in the story window are 'active' and clicking on any of them will display a list of stories containing that word.

While a story is displayed, any relevant 'multimedia' buttons are highlighted. These buttons give further information on the current story, such as where the story takes place on the globe, the position of any mentioned elements on the periodic table or the distance from Earth to an aerospace event. Certain stories have a movie camera icon which, when clicked, displays static graphics and digitised video relating to the story. Another icon displays a first-person account of events relating to the current story and in some cases is accompanied by a voiceover.

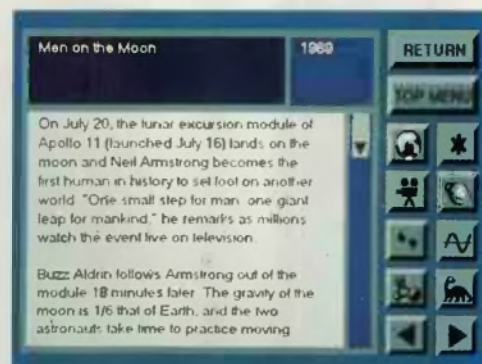
Reference material

Apart from providing information on events and discoveries, the *Timetable of History — Science and Innovation* can be used as a reference for chemistry or geology. The periodic table gives information on all the elements and there is a geochronologic time line which shows the evolution of life on Earth from the Pre-Cambrian era to the present day. It's not degree level stuff, but it's ideal for schoolchildren or writers who just want a bit of background information.

A nice feature is the Historical Time Line, which shows a section of time covering a few thousand years (from 4000BC to 1990AD) and important events are displayed above, depending on the position of the slider. When an event is selected, you see pictures and listen to a spoken explanation. Alternatively, a section of the time line spanning just a few years can be selected and all the events in that pe-

riod will be listed; you can then choose what you want more information on.

The literature that accompanies the CD states that a Sound Blaster card is recommended. I've got a Thunderboard, which is Sound Blaster compatible, but I didn't hear a peep out of it. All the speech and sound effects that I came



across were from the audio output of the CD player.

CD-ROM drives are not super-fast, so data searches are not instantaneous, but they don't take too long and it's worth the wait. The only problem was with the speech and moving video. The voiceover would pause after every few words while the drive accessed an-



other sector of the CD, and the full-motion video was jerky to say the least. Still, this is the best CD-ROM product I have seen for a while, although that could be due to the lack of competition.

Time Table of History — Science and Innovation costs £99 + VAT from Software Toolworks on (0444) 831761.

Menu Works Advanced

Menu Works Advanced takes a lot of the hard work out of DOS disk maintenance. Glamorous it isn't, but its friendly, functional approach is nice, says Helen Johnstone.

Hard disk management can be a chore, especially when it means struggling with DOS to organise directories and arrange files. With Menu Works Advanced, most simple disk management tasks can be taken care of without having to look at a C> prompt. Even for users who know their way around DOS, Menu Works can take a lot of the elbow work out of it.

In addition, it takes care of many of the other odd jobs of the System Man-

From this menu, Windows or any of the PC's applications can be started, regardless of their directory or path.

Alternatively, one of Menu Works Advanced's features can be activated. An immediate review of the disk space or the contents of directories on the hard disk can be obtained from the main menu, using specially assigned function keys. It also provides quick access to DOS, either by exiting from Menu Works or by using the DOS shell.

modate left-handed users.

It is also in the Maintenance option that security levels are set. Password access can be allocated to up to 99 users, with up to 99 different security levels to restrict access to files, applications and the Menu Works operations. For a shared PC, such a utility could be invaluable, not just for privacy but in order to prevent inexperienced users damaging the system.

Workable blanks

Menu Works also provides a way to customise menus or build new ones. The manual covers the principles behind menu construction and gives examples of how to produce workable blanks. For the IT manager using Menu Works over a large workgroup, more advanced menus can be constructed to help standardise PC operation.

Also for the multi-user environment is a feature that sets up automatic disk monitoring and checks the use of each licensed individual, if necessary. It might sound like Big Brother, but could be valuable in sounding the alert when disk space has got low. When available disk space drops be-

low a set value, the PC flashes a warning on the screen as the machine is powered up.

Although much of what Menu Works does can be done equally well with Windows File Manager, if you don't have Windows it is a relatively easy way of looking after the hard disk. It also provides a much friendlier approach to PC applications than DOS, particularly for those who are only casual users, and on shared PCs the security options could be a real bonus.

Although Menu Works Advanced is not the most glamorous-looking software, it could be a handy package to have for those occasional, unpleasant disk maintenance chores.

Menu Works Advanced costs £90. It is distributed by Skylane Systems on (0702) 549988.



ager or whoever is controlling the PC. It covers a range of functions for setting security options, disk monitoring and menu customisation that will generally be most useful on shared PCs, but can also be handy for the single user.

Menu Works Advanced runs on XT, AT and PS/2 PCs and networks, with DOS 2.0 or higher and 512K system RAM. It recognises around 2500 programs and automatically builds access to them in menus, based on application type. It also operates in conjunction with Windows, although it appeared to prevent access to the DOS Command through Windows.

Starting applications

Allowing the program to run its own automatic installation procedure sets up the PC to display the Menu Works main menu each time the PC is booted.

The Disk Manager is perhaps one of the more useful of the functions of Menu Works. Files can be deleted, renamed, moved, sorted and copied with the Disk Manager. The tagging feature allows files to be tagged across directories and running totals are kept of the number of files in each directory and the directory size.

Maintenance

Most of the system customisation operations are reached through the Disk Maintenance option. Using pull-down menus, the maintenance section allows users to customise the hardware settings, including the display colours and mouse sensitivity, and allows these settings to be adapted to each individual user licensed for the system. One example, given in the manual, shows how to set the mouse to accom-

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PRODUCT	PANTHER	MIDSTATION	PC SX	PUMA	PC V	PC VII	CHEETAH	PC 486
Processor	Intel 80386SX	AMD 80386SX	AMD 80386SX	Intel 80386DX	Intel 80386DX	AMD 80386DX	Intel 80486DX	Intel 80486DX
Speed	16MHz	25MHz	25MHz	25MHz	25MHz	40MHz	25 or 33MHz	33 or 50MHz
Memory Cache	-	-	-	-	-	64Kb Exp. 256Kb	64Kb Exp. 256Kb	256Kb
Memory options	1Mb Exp. 8Mb	1Mb Exp. 32Mb	1Mb Exp. 20Mb	1Mb Exp. 8Mb	1Mb Exp. 16Mb	1Mb Exp. 64Mb	1Mb Exp. 32Mb	1Mb Exp. 64Mb
Floppy	1.4Mb	1.4Mb	1.4Mb	1.4Mb	1.4Mb	1.4 & 1.2Mb	1.4Mb	1.4 & 1.2Mb
IBM Hard Disk	40Mb	40Mb	40Mb	40Mb	40Mb	40Mb	40Mb	40Mb
HDD Access	17ms	17ms	17ms	17ms	17ms	17ms	17ms	17ms
HDD Cache	32Kb	32Kb	32Kb	32Kb	32Kb	32Kb	32Kb	32Kb
I/O Ports	2xS, 1xP	2xS, 1xP, 1xM	2xS, 1xP	2xS, 1xP	2xS, 1xP	2xS, 1xP	2xS, 1xP	2xS, 1xP
14" VGA Monitor	Colour 640 x 480	Colour 1024 x 768 Super VGA	Colour 1024 x 768 Super VGA	Colour 640 x 480	Colour 1024 x 768 Super VGA	Colour 1024 x 768 Super VGA	Colour 640 x 480	Colour 1024 x 768 Super VGA
DOS	DR DOS 6	DR DOS 6	DR DOS 6	DR DOS 6	DR DOS 6	DR DOS 6	DR DOS 6	DR DOS 6
Warranty	12 Months	12 Months	12 Months	12 Months	12 Months	12 Months	12 Months	12 Months
PRICE	649	899	949	899	999	1249	1249 for 25MHz	1599 for 33MHz



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Company _____
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- 1 How long have you been reading PCW?
Less than 1 year ☐¹ 1-2 years ☐²
2-5 years ☐³ More than 5 years ☐⁴
- 2 Do you think PCW has got better or worse since you first bought it?
Better ☐¹ Worse ☐²
- 3 Do you think PCW has got better or worse over the last year?
Better ☐¹ Worse ☐²
- 4 Are you a PCW subscriber?
Yes ☐¹ No ☐²
- 5 If not, how often, on average, do you buy PCW?
Every issue ☐¹ Every other issue ☐²
Occasionally ☐³ Infrequently ☐⁴
- 6 If you don't buy PCW every issue, why do you buy it?
To purchase hardware/software ☐¹
Interesting cover ☐²
Specific hardware reviews ☐³
Specific software reviews ☐⁴
Specific features ☐⁵
Regular columns ☐⁶
Other reason ☐⁷
If other reason, please give details

7 How many other people read your copy of PCW?

8 Given the limited space we have, which areas should be given more or less coverage?

	<input type="checkbox"/> ¹ A lot more	<input type="checkbox"/> ² A little more	<input type="checkbox"/> ³ About the same	<input type="checkbox"/> ⁴ A little less	<input type="checkbox"/> ⁵ A lot less
Advertisements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sounding Off	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In Business	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Straight Talking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diary	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
UK News	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
US News	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
European News	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Far East News	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Letters	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Short Reviews	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Long Term Tests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inside Out	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Books	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Screenplay	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Leisure Lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Numbers Count	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Frontiers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Innovations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chip Chat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hardware Group Tests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Software Group Tests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PC platform reviews	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Macintosh platform reviews	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unix platform reviews	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Proprietary platforms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PC Peripherals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Mac Peripherals	<input type="checkbox"/> 136	<input type="checkbox"/> 137	<input type="checkbox"/> 138	<input type="checkbox"/> 139	<input type="checkbox"/> 140
PC Software	<input type="checkbox"/> 141	<input type="checkbox"/> 142	<input type="checkbox"/> 143	<input type="checkbox"/> 144	<input type="checkbox"/> 145
Mac Software	<input type="checkbox"/> 146	<input type="checkbox"/> 147	<input type="checkbox"/> 148	<input type="checkbox"/> 149	<input type="checkbox"/> 150
Applications stories	<input type="checkbox"/> 151	<input type="checkbox"/> 152	<input type="checkbox"/> 153	<input type="checkbox"/> 154	<input type="checkbox"/> 155
Programming tutorials	<input type="checkbox"/> 156	<input type="checkbox"/> 157	<input type="checkbox"/> 158	<input type="checkbox"/> 159	<input type="checkbox"/> 160
'How to' articles	<input type="checkbox"/> 161	<input type="checkbox"/> 162	<input type="checkbox"/> 163	<input type="checkbox"/> 164	<input type="checkbox"/> 165
How it works articles	<input type="checkbox"/> 166	<input type="checkbox"/> 167	<input type="checkbox"/> 168	<input type="checkbox"/> 169	<input type="checkbox"/> 170
Hands On	<input type="checkbox"/> 171	<input type="checkbox"/> 172	<input type="checkbox"/> 173	<input type="checkbox"/> 174	<input type="checkbox"/> 175
Beginners	<input type="checkbox"/> 176	<input type="checkbox"/> 177	<input type="checkbox"/> 178	<input type="checkbox"/> 179	<input type="checkbox"/> 180
Utilities	<input type="checkbox"/> 181	<input type="checkbox"/> 182	<input type="checkbox"/> 183	<input type="checkbox"/> 184	<input type="checkbox"/> 185
Word Processing	<input type="checkbox"/> 186	<input type="checkbox"/> 187	<input type="checkbox"/> 188	<input type="checkbox"/> 189	<input type="checkbox"/> 190
Spreadsheets	<input type="checkbox"/> 191	<input type="checkbox"/> 192	<input type="checkbox"/> 193	<input type="checkbox"/> 194	<input type="checkbox"/> 195
Databases	<input type="checkbox"/> 196	<input type="checkbox"/> 197	<input type="checkbox"/> 198	<input type="checkbox"/> 199	<input type="checkbox"/> 200
Low Level	<input type="checkbox"/> 201	<input type="checkbox"/> 202	<input type="checkbox"/> 203	<input type="checkbox"/> 204	<input type="checkbox"/> 205
Windows & OS/2	<input type="checkbox"/> 206	<input type="checkbox"/> 207	<input type="checkbox"/> 208	<input type="checkbox"/> 209	<input type="checkbox"/> 210
Macintosh	<input type="checkbox"/> 211	<input type="checkbox"/> 212	<input type="checkbox"/> 213	<input type="checkbox"/> 214	<input type="checkbox"/> 215
Unix	<input type="checkbox"/> 216	<input type="checkbox"/> 217	<input type="checkbox"/> 218	<input type="checkbox"/> 219	<input type="checkbox"/> 220
Networks	<input type="checkbox"/> 221	<input type="checkbox"/> 222	<input type="checkbox"/> 223	<input type="checkbox"/> 224	<input type="checkbox"/> 225
Readers' Tips	<input type="checkbox"/> 226	<input type="checkbox"/> 227	<input type="checkbox"/> 228	<input type="checkbox"/> 229	<input type="checkbox"/> 230
Computer Answers	<input type="checkbox"/> 231	<input type="checkbox"/> 232	<input type="checkbox"/> 233	<input type="checkbox"/> 234	<input type="checkbox"/> 235

9 Which article, over the last 12 months, did you enjoy the most?

10 What subjects not currently covered by PCW would you like to see included?

11 Which part of the magazine do you usually read first?

12 Which parts do you never read?

13 Is there any factor that might make you read sections you would otherwise skip?

14 Rate these elements of a Benchtest in order of importance (10 = most, 1 = least):

Performance scores

Photography

Annotated photograph

Detailed technical review

Subjective overview

Specifications box

Author's name

Manufacturer's name

15 How do you feel we could improve the PCW Benchtests?

16 In 1991, PCW introduced Group Tests. How useful do you consider them to be?

Sole reference in buying decisions ☐¹

Useful in conjunction with reviews and ad's ☐²

Interesting but not useful ☐³

Waste of space ☐⁴

17 Do you feel each Group Test is:

Too Long ☐¹ Too Short ☐² About Right ☐³

18 Do you feel we cover:

Too many products ☐¹

Too few products ☐²

About right ☐³

19 Do you feel that each Group Test review is:
Too Long ☐¹ Too Short ☐² About Right ☐³

20 Do you like the Good Points/BadPoints/Conclusion sections?
Yes ☐¹ No ☐²

21 Are there any other comments you would like to make about the Group Tests?

22 How old are you?
Under 18 ☐¹ 18-25 ☐² 25-35 ☐³ 35-50 ☐⁴
Over 50 ☐⁵

23 Are you: Male ☐¹ Female ☐²

24 Please indicate your income bracket
Under £10k ☐¹ £10k-£15k ☐²
£15k-£20k ☐³ £20k-£25k ☐⁴
£25k-£35k ☐⁵ Over £35k ☐⁶

25 How large is the company you work for?
Self employed ☐¹ 10-50 ☐² 50-200 ☐³
200-1000 ☐⁴ Over 1000 ☐⁵

26 What is your company's annual turnover?
Up to £500k ☐¹ £500k-£1m ☐²
£1m-£5m ☐³ £5m-£10m ☐⁴
£10m-£50m ☐⁵ £50m-£100m ☐⁶
Over £100m ☐⁷

27 Is the principal activity of your company computer related?
Yes ☐¹ No ☐²

28 If not, what is your company's core business?

29 What is your job title?

30 Do you authorise expenditure on computer equipment for your company?
Yes ☐¹ No ☐²

31 What kind of computers do you use?

	Own	Use	Plan to buy
80486 PC	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
80486SX	<input type="checkbox"/> ⁴	<input type="checkbox"/> ⁵	<input type="checkbox"/> ⁶
80386	<input type="checkbox"/> ⁷	<input type="checkbox"/> ⁸	<input type="checkbox"/> ⁹
80386SX	<input type="checkbox"/> ¹⁰	<input type="checkbox"/> ¹¹	<input type="checkbox"/> ¹²
80286	<input type="checkbox"/> ¹³	<input type="checkbox"/> ¹⁴	<input type="checkbox"/> ¹⁵
8088/8086	<input type="checkbox"/> ¹⁶	<input type="checkbox"/> ¹⁷	<input type="checkbox"/> ¹⁸
386 notebook	<input type="checkbox"/> ¹⁹	<input type="checkbox"/> ²⁰	<input type="checkbox"/> ²¹
Other notebook	<input type="checkbox"/> ²²	<input type="checkbox"/> ²³	<input type="checkbox"/> ²⁴
Laptop	<input type="checkbox"/> ²⁵	<input type="checkbox"/> ²⁶	<input type="checkbox"/> ²⁷
Mono Macintosh	<input type="checkbox"/> ²⁸	<input type="checkbox"/> ²⁹	<input type="checkbox"/> ³⁰
Colour Macintosh	<input type="checkbox"/> ³¹	<input type="checkbox"/> ³²	<input type="checkbox"/> ³³
Intel Unix workstation	<input type="checkbox"/> ³⁴	<input type="checkbox"/> ³⁵	<input type="checkbox"/> ³⁶
Non-Intel Unix	<input type="checkbox"/> ³⁷	<input type="checkbox"/> ³⁸	<input type="checkbox"/> ³⁹
ST	<input type="checkbox"/> ⁴⁰	<input type="checkbox"/> ⁴¹	<input type="checkbox"/> ⁴²
Amiga	<input type="checkbox"/> ⁴³	<input type="checkbox"/> ⁴⁴	<input type="checkbox"/> ⁴⁵
Archimedes	<input type="checkbox"/> ⁴⁶	<input type="checkbox"/> ⁴⁷	<input type="checkbox"/> ⁴⁸

32 Approximately, how much do you expect to spend on hardware over the next 12 months?

32 Approximately, how much do you expect to spend on hardware over the next 12 months?

33 Approximately, how much do you expect to spend on software over the next 12 months?

34 Approximately, how much will your company spend on hardware and software over the next 12 months?

35 Do you use a network?
Yes ☐¹ No ☐²

36 Which operating system do you use, or expect to use?

	Today	Next Year	3 Years' Time
CP/M	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
DOS	<input type="checkbox"/> ⁴	<input type="checkbox"/> ⁵	<input type="checkbox"/> ⁶
Windows 3.x	<input type="checkbox"/> ⁷	<input type="checkbox"/> ⁸	<input type="checkbox"/> ⁹
Windows NT	<input type="checkbox"/> ¹⁰	<input type="checkbox"/> ¹¹	<input type="checkbox"/> ¹²
Unix	<input type="checkbox"/> ¹³	<input type="checkbox"/> ¹⁴	<input type="checkbox"/> ¹⁵
OS/2	<input type="checkbox"/> ¹⁶	<input type="checkbox"/> ¹⁷	<input type="checkbox"/> ¹⁸
IBM/Apple Pink	<input type="checkbox"/> ¹⁹	<input type="checkbox"/> ²⁰	<input type="checkbox"/> ²¹
Other...			

37 Which other computer magazines do you read?
Amiga Format Byte Computer Buyer
Computer Shopper Mac User Mac World (UK)
Mac World (US) Micro Decision PC Direct
PC Magazine (UK) PC Magazine (US) PC Plus
PC Review PC Today PC User PC Week
Personal Computer Magazine ST Format
What Micro? What Personal Computer
Which Computer? Other...

38 If you are entitled to receive industry magazines free of charge, why do you buy PCW?

39 Apart from PCW, what is your favourite computer magazine?

40 Which non-computer magazines do you read?
Amateur Photographer Angling Times
Autocar & Motor Autosport Car What Car?
The Economist Empire Esquire
Flight International GQ High Fidelity
What HiFi? New Scientist
Scientific American Private Eye Q
Radio Times TV Times 90 Minutes
When Saturday Comes Which? Other...

41 Which daily newspaper do you read?
Daily Express Daily Mail Daily Mirror Guardian
Independent Telegraph Times

Please return your completed questionnaire to:
PCW Readers' Survey 1992, Freeport 25,
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1. **Viglen**

*The 1991 independent survey, the 'Quality of IT Suppliers' by Computer Weekly, ranked Viglen No.1 overall for its quality as a PC supplier, for its technical staff, general capabilities, for its products and for competitive pricing.

The Choice is Yours



Viglen's new Genie range offers a new standard in personal computers. It offers, at the top end of the range, a uniquely simple upgrade option. But most of all, it offers you the opportunity to decide on the performance, packaging and facilities you want in your ideal computer.

A choice of processors

.... and a simple upgrade method

From the 386SX running at a very fast 25 MHz to the most powerful 486DX, you can choose the processing power you need in the case style you require. The 386DX, 486SX and 486DX models also incorporate Viglen's unique JAC-UP™ design, so upgrading to a higher processor simply means adding the relevant cpu chip rather than an expensive board (the JAC-UP™ logo identifies models with this feature).

A choice of cases for future expansion

Storage and expandability will determine your choice of case. Viglen offers no less than four options, from the very small Genie Micro (which can include a 500MB hard disk, a 1.44MB floppy and still have room for two full length AT expansion cards), to the Tower Case for the highest number of internal drive options.

Now choose your ideal computer

By using the five simple steps shown here, you can put together the computer you need. Check out the processing power you require, select the case styling, choose the model from the table, add any further options and then call us. It really is that easy. The new Viglen Genie range gives you the power to buy the computer you need for now and for the future.

Standard specification for the whole desktop range

All Viglen desktop computers have the following standard specification, and come complete and ready to use.

- Full IBM PC/AT compatible
- Fully MS-DOS, OS/2, Xenix, Unix and Novell compatible
- One 1.44MB floppy drive, option for others
- Two serial, one parallel port
- Choice of very fast (<18ms) hard disk and RAM options
- Ultra fast super VGA 1024 x 768 display with 512K of video RAM as standard (expandable to 1MB)
- All colour systems are supplied with a very high resolution 1024 x 768 (28 dot pitch) super VGA plus-sync monitor. Mono systems are supplied with a standard resolution paper white mono VGA monitor
- 102 key enhanced keyboard with unique Viglen design giving a compact keyboard with standard layout
- Microsoft compatible serial mouse
- Microsoft MS-DOS 5 with options for other operating systems
- Microsoft Windows 3 pre-installed (Just type WIN to get started)
- User friendly manuals
- 12 months parts and labour warranty with option for low-cost on-site parts and labour maintenance up to 4 years
- Free lifetime hotline technical support



Decide upon the power

The power and speed of a computer system is mainly determined by the type of processor chip used. The following paragraphs give a brief description of the currently available processors, its capabilities and the additional specification of the models which use it.

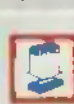
386SX A 16/32 bit processor running up to 25MHz, making the Viglen Genie 386SX system one of the fastest of its kind. Suited for most general office applications such as word processing, spreadsheets etc, and is a powerful entry level system. Full 32 bit software increases the power and speed of Windows 3 by running in 32 bit enhanced mode (minimum of 2MB of RAM is required). Although an entry level system, it provides more power at lower cost than ever before and can be used for all applications. It is also suitable for use as a powerful network workstation.

Model No:	386SX25
Processor	386SX
Speed	8/25MHz
Co-Processor Socket	80387SX
Landmark Ver 2.0	>33MHz
SI ver 5	>13.7
Power Meter MIPs	>4

386DX A full 32 bit processor running up to 33/40MHz. Ideal for more demanding single and multi user applications. Suitable for processor hungry applications such as desktop publishing, CAD (Computer Aided Design), Multi Tasking applications such as OS/2, Multi User applications such as Xenix and Unix as well as being an ideal File Server for applications using a Novell Network.

Model No:	3DX33
Processor	386DX
Speed	8/33MHz
Cache	64K upgradeable to 1MB
Co-Processor Socket	80387DX
Landmark Ver 2.0	>51MHz
SI ver 5	>36
Power Meter MIPs	>7.9

All models bearing the JAC-UP logo include the Vacancy socket as advertised by Intel on National Television and Press.



Just Add Cpu UPgradable

"Upgradeability with a difference!" The new Viglen Genie 3DX, 4SX and 4DX models now incorporate the unique JAC-UP™ (Just Add Cpu - UPgradeable) technology which unlike most other systems, provides an upgrade path from a 386DX to a 486SX or 486DX without replacement of expensive CPU modules or cards. This unique design

486SX A 32 bit processor with 8K of cache built in on the processor chip and designed to cut instruction cycle time. Much faster than 386DX based systems, these are suitable for the same applications and can be further upgraded with the addition of faster performance upgrade processors from Intel or to a full 486DX running at the highest speed.

Model No:	48SX20
Processor	486™SX
Speed	8/20MHz
Cache	64K upgradeable to 1MB
Co-Processor Socket	487SX/Performance Enhancement Processor Socket
Landmark Ver 2.0	>66MHz
SI ver 5	>43
Power Meter MIPs	>8.8

486DX The most powerful processor in the range, the 486DX has the same basic characteristics as the 486SX but with a maths co-processor built into the chip and running at much higher frequencies. Suited to the highest demanding applications. Not only can the system run at extremely high speeds, but the in-built maths co-processor further speeds up applications such as spreadsheets and CAD. 486DX based systems are therefore suitable as a very powerful single user system or for the most complex multi user and network environments. As a file server, the 486DX system provides the fastest possible solution to a large network system up to 250 users.

There are two models in the 486DX range. The standard 4DX model uses the Industry Standard Architecture (ISA) BUS and the 4DX33-EISA model uses the Extended ISA (EISA) bus.

The EISA model with its 32 bit expansion bus, Caching SCSI Hard Disk system, and WRITEBACK cache is particularly suited for large file server applications or Unix X-Windows based graphics workstations.

Model No:	4DX33	4DX33-EISA
Processor	486™DX	486™DX
Speed	8/33MHz	8/33MHz
Cache	64K upgradeable to 1MB	128K WRITEBACK
Co-Processor Socket	Weitek 4167	Weitek 4167
Landmark Ver 2.0	>111MHz	>111MHz
SI ver 5	>72	>72
Power Meter MIPs	>14.7	>14.7

allows all upgrades to be done simply by adding the relevant CPU chip only onto the motherboard itself. These systems have also been designed to allow for the addition of the soon to be launched Intel 486™ SX Performance Upgrade processor which can almost double the system performance instantly.

Choose the Case Styling



The Genie Micro is the smallest of the new Genie range. Even in this small size, it is capable of taking two full length and full AT height expansion cards. With a standard system fitted with a 3.5" floppy drive, the Genie Micro is also capable of accommodating a hard disk of up to 500MB.

The Genie Micro is suitable for most applications and because of its small size is particularly appropriate for use as workstations in a network.



The Genie Executive has an ingenious design which provides a very small footprint system with a high expansion capability. It can be fitted with a 3.5" or 5.25" Floppy Drive or both, with 6 free expansion slots and provides for a hard disk capacity of up to 1GB. The Genie Executive offers unrivalled expansion for its size. With a base area not much larger than the area taken by the monitor alone, the Genie Executive system takes less desktop space with more expansion facilities than any other small footprint system.

The Genie executive system is suitable for most applications and is likely to satisfy the majority of users.

Specification

Dimensions (WxHxD)mm: 265 x 80 x 390
Expansion Slots: 2 free 16 bit full length

Typical Drive Combinations

The standard system is supplied with a single 1.44MB floppy drive. In this configuration the Genie Micro case can be fitted with a hard disk of up to 500MB capacity.

Dimensions (WxHxD)mm: 330 x 105 x 390
Expansion Slots: 6 free in total; 3 free 16 bit full length plus another 3 free 16 bit half length.

The standard system is supplied with a 1.44MB floppy disk drive. In this configuration the Executive case can be fitted with a hard disk of up to 1GB capacity and higher in future. If a dual 1.44 and 1.2MB double decker drive option is chosen, then the maximum hard disk capacity is 500MB. Other drive options such as CD-ROM or Tape Back-up Streamer are also available.



Identify the Model from

CASE STYLE				GENIE MICRO		GENIE EXECUTIVE	
PROCESSOR	MODEL	RAM	HARD DISK	MONO VGA	COLOUR SUPER VGA	MONO VGA	COLOUR SUPER VGA
386SX 25MHZ	3S05-HD1M	1M	40MB	M114M £847	M114C £997	E114M £848	E114C £998
	3S05-HD4M	4M	100MB	M141M £1007	M141C £1157	E141M £1008	E141C £1158
386DX 33MHZ	3D131-HD4M	4M	100MB	M341M £1147	M341C £1297	E341M £1148	E341C £1298
	3D131-HD8M	8M	200MB	M382M £1547	M382C £1697	E382M £1548	E382C £1698
486SX 20MHZ	4S20-HD4M	4M	100MB	M541M £1247	M541C £1397	E541M £1248	E541C £1398
	4S20-HD8M	8M	200MB	M582M £1617	M582C £1767	E582M £1618	E582C £1768
486DX 33MHZ	4D131-HD4M	4M	100MB	M741M £1407	M741C £1557	E741M £1408	E741C £1558
	4D131-HD8M	8M	200MB	M782M £1777	M782C £1927	E782M £1778	E782C £1928
486DX 33MHZ EISA	4D131-EISA-SC340	4M	200MB SCSI				
	4D131-EISA-SC380	8M	400MB SCSI				



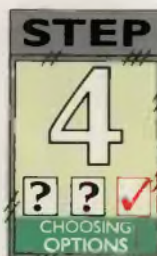
At the heart of the Viglen 486 systems is the powerful 486 processor from Intel.

The above shows only a few of the model ranges available. For more of the options please contact our Sales Department.

All prices exclude VAT



Specify any Option



The Options

All the systems supplied by Viglen are complete and ready to go. No extras are required. However, Viglen provide many options and alternatives to give even more choice. Some of the options are listed in the tables to the right. Please specify the relevant product code for any options required when ordering. Note that these prices are applicable when ordering at the same time as the main system.



GENIE PROFESSIONAL

The Genie Professional provides even higher drive expansion capabilities than the Genie Micro or Genie Executive in a larger case.

The Genie Professional is most suited to the user who requires additional internal drive options.

The photo above shows the Professional fitted with the additional 1.2MB floppy drive option.

Dimensions (WxHxD)mm: 380x150x415
Expansion Slots: 5 free 16 bit full length.

The standard system is supplied with a single 1.44MB floppy drive. In this configuration the maximum hard disk capacity exceeds 1GB, leaving two 5.25 inch drive bays vacant for future expansion.

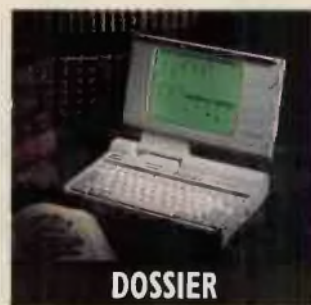


VIG TOWER CASE

The Viglen Tower case provides for the highest number of internal options for the most demanding users. This amount of capability is not normally required for the majority of users, but can be useful if the computer is being used as a file server or a multi user host. The Tower case is available for the 4SX20, 4DX33 and 4DX33-EISA models only.

Dimensions (WxHxD)mm: 190x650x425
Expansion Slots: 6 Free slots. 16 bit for the standard model and 32 bit for the EISA model.

The standard system is supplied with a 1.44MB and 1.2MB floppy drive. In this configuration the tower system has six extra 5.25" half height bays which can accommodate many different drive configurations.



DOSSIER

The Viglen Dossier packs unrivalled power into an A4, notebook sized computer. It boasts a 32 bit 386SX processor running at 20MHz, with 2MB RAM (expandable to 8MB) and 60MB hard disk as standard (expandable to even higher capacity in future). A super fast paper white LCD screen with 32 grey levels and VGA resolution gives superb display quality with the ability to connect to an external VGA colour monitor if required. With an average battery life of 3 hours and over, the Viglen Dossier is the ideal portable office for those people on the move.

- Fully IBM PC/AT compatible, will also run 32 bit software written for the 80386/80486 processors.
- 80386SX processor with 80387SX co-processor socket
- Speed of 6/20MHz.
- 2MB RAM (384K shadow RAM) expandable to 8MB.
- Fast 60MB hard disk, option for higher in future.
- 1.44MB 3.5" floppy drive
- Super fast paper white LCD screen with CCFT side light. VGA display with 32 shades of grey and EGA/CGA/MDA emulation
- Low profile 81 key keyboard with click feeling contact switch.
- MS-DOS 5.0 and Microsoft Windows 3.
- 1 parallel/external floppy port, 1 serial port, 1 external keyboard socket (PS/2 or AT), external colour VGA monitor socket, AT expansion bus socket.
- Size 297mm (W) x 51mm (H) x 216mm (D).
- Weight 2.97kg (6.6lb) with battery.
- Fully removable and rechargeable in Nicad battery.
- Battery life average 3 hours, universal AC adaptor.
- Carrying pouch for Dossier and accessories.
- Landmark speed (ver 2.0) = 22.68MHz.
- SI (ver 4.5) = 21.2 powermeter MIPS = 3.52.

the table

GENIE PROFESSIONAL

VIG TOWER

DOSSIER

MONO VGA	COLOUR SUPER VGA	MONO VGA	COLOUR SUPER VGA
PRODUCT CODE L114M £849	PRODUCT CODE L114C £999		
PRODUCT CODE L141M £1009	PRODUCT CODE L141C £1159		
PRODUCT CODE L341M £1149	PRODUCT CODE L341C £1299		
PRODUCT CODE L382M £1549	PRODUCT CODE L382C £1699		
PRODUCT CODE L541M £1249	PRODUCT CODE L541C £1399	PRODUCT CODE T541M £1457	PRODUCT CODE T541C £1607
PRODUCT CODE L582M £1619	PRODUCT CODE L582C £1769	PRODUCT CODE T582M £1827	PRODUCT CODE T582C £1977
PRODUCT CODE L741M £1409	PRODUCT CODE L741C £1559	PRODUCT CODE T741M £1617	PRODUCT CODE T741C £1767
PRODUCT CODE L782M £1779	PRODUCT CODE L782C £1929	PRODUCT CODE T782M £1987	PRODUCT CODE T782C £2137
PRODUCT CODE L942SM £3549	PRODUCT CODE L942SC £3699	PRODUCT CODE T942SM £3708	PRODUCT CODE T942SC £3858
PRODUCT CODE L984SM £3999	PRODUCT CODE L984SC £4299	PRODUCT CODE T984SM £4158	PRODUCT CODE T984SC £4458

DS160 £1599

A host of options are available for the Dossier including external monitor, keyboard, external floppy drive etc.

Some of the more popular ones are listed below:

- 2MB extra RAM factory fitted on motherboard £159 + VAT
- 2MB RAM module £159 + VAT
- 4MB RAM module £316 + VAT
- Worldport 2496 fax/data modem £479 + VAT
- Worldport 2400MTPNS external modem £379 + VAT
- Acoustic coupler to either modems above £49.95 + VAT
- External ethernet module £249 + VAT



Product Code	Description	Price	Product Code	Description	Price
VU101	Additional 1.2MB Floppy Drive fitted. For Genie Professional Case only	£ 49.00 +VAT	VR101	RAM Upgrade from 1MB to 2MB	£ 44.00 +VAT
V1221	Dual 1.44 and 1.2MB floppy drive instead of a single 1.44MB drive. For Genie Executive and Genie Professional. This is a double decker drive which fits in a single 5.25" drive bay thus saving space.	£ 88.00 +VAT	VR202	RAM Upgrade from 2MB to 4MB	£ 88.00 +VAT
VA051	Additional 512K of Video RAM for 256 Colours in 1024x768 mode	£22.00 +VAT	VR404	RAM Upgrade from 4MB to 8MB	£176.00 +VAT
VA059	80387SX-20 Maths Co-Processor for models: 3SX25	£115.00 +VAT	VR808	RAM Upgrade from 8MB to 16MB	£352.00 +VAT
VA066	80387DX-33 Maths Co-Processor for models: 3DX33	£176.00 +VAT	OSM	12 months On-Site maintenance for all desktop systems (call for prices for extending up to 4 years)	£ 69.00 +VAT
			OSMD	12 Months On-Site Maintenance for Dossier Notebook PC	£ 99.00 +VAT

For many more options, such as higher capacity hard disks, CD-ROM drives, Network cards, Tape Backup systems, Modems, OS/2, Unix, Novell and others, please contact our sales department.

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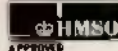
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The quality and reliability of products produced by Viglen is second to none. Yet again Viglen ranked No.1 in the UK for quality of PC/workstations.*

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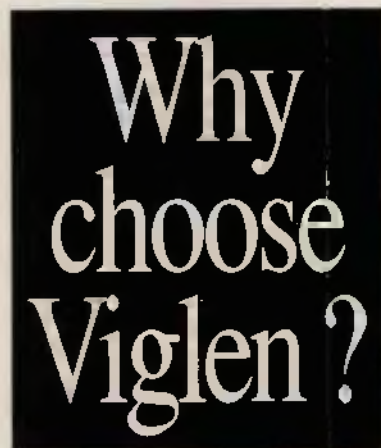
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* Computer Weekly independent datapro survey 1991



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Product of the month



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PRODUCT CODE E7HSC
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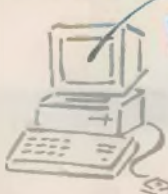
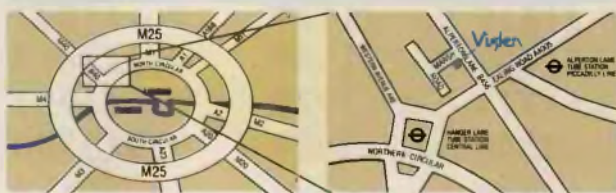
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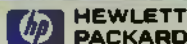


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Palm tops

Handhelds have an image as yuppie toys, but they present a fascinating design challenge and have huge sales for specialist uses. David Brake and our team tested 16, most of them very good in their niche fields so picking one out is more than usually a case of horses for courses.

The past few months have seen an explosion in the number of handheld computers of one kind or another, and the next year will see many more emerge, taking advantage of advances in low-power processors, memory cards, wireless communications, and pen-based software.

The handheld machines in this Group Test fall into four main groups. The first consists of the bare-bones systems, with street prices of less than £100. They offer primitive data-entry and retrieval capabilities, plus calculators and other gadgets. For a few more pounds you get the ability to connect to a PC, to help you transfer names and phone numbers. If that is all you need, these machines will be adequate.

Pocket PC compatibility

The second, and fastest growing, group is the PC-compatibles. The capability of these machines has grown greatly since the pioneering launch of the Atari Portfolio/DIP in 1989. With the exception of the unlabeled Poqet PC, you get what you pay for. For £170 plus VAT (or possibly less), there's the Atari Portfolio with 128K memory and DOS 2.11 compatibility (mostly). For four times that price, you get the Sharp PC-3000, which has a whole megabyte of memory, a full-sized screen, a usable keyboard, and DOS 3.3 compatibility.

A coalition of companies, including DIP and Intel, is developing a basic pocket-computer design around a faster processor from Chips & Technologies (see 'News', PCW February, page 99).

The third group consists of the more powerful handheld organisers which are not PC-compatible. Why bother, when you can put a PC in your pocket? Because DOS doesn't lend itself to the

demands of pocket computing. Low-power pocket memory costs much more than desktop PC SIMMs, so the 640K considered the absolute minimum for DOS adds substantially to the price. The screen real estate that PC software expects is difficult to get around as well. And as for storage... well, it'll be a while before you'll be able to fit 40Mb economically onto a pocket PC.

Proprietary operating systems can be much more economical of system resources. And so long as you get the programs you need, and you can get the data to and from your PC, does it matter what the pocket operating system is? That is what Psion would say, and after trying its Series 3, I'm inclined to agree.

Some of the most exciting handheld machines coming in the next year or so will not be based on PCs. General Magic, a spin-off company full of ex-Apple employees, has been working for a year and a half on a Personal Intelligent Communicator (wireless, connects with a Mac and maybe with a PC and with a very easy-to-use interface—see 'News', PCW November). Apple itself is looking at creating several machines for the market, including the similar sounding Personal Digital Assistant, for launch late this year or more likely some time in 1993.

Apple says it will be licensing some of its consumer-oriented software to third parties, so you may see more similar products from other firms later in '93 (Sony seems a likely candidate).

DIY systems

The odd group out comprises the machines supplied unprogrammed. These are intended for system designers to build into their great schemes for use by workers on the move or away from

desktops. There's a wide range, from the cheap and cheerful Organiser II to the high-end power machines like the GRiD and the Husky FS2. In selecting a machine for your in-house applications, the cost of developing the software will normally take priority over the price of the machines themselves. This is where PC compatibles score—so long as they are compatible.

Applications in this area range from warehouse workers running stock control applications to field surveyors entering data on the move. Such machines can also be built into OEM products, such as navigation computers.

Canon Wordtank

Canon's Wordtank is billed principally as a multilingual intelligent electronic dictionary, and the review machine was supplied with both French and German dictionaries on the optional memory cards. However, most of the features that we have come to expect from a modern 'electronic organiser' are also included. Sort of.

The design is rather strange: the Wordtank looks like a Psion Series 3, with a large chunk on the left side. This chunk, which doubles as a handle and a battery case, has ridges moulded into both top and bottom surfaces, and falls naturally into the left hand.

The hinge which connects the screen to the qwerty keyboard is very loose, so the only usable orientation is with the machine folded out flat—in the intermediate positions, the screen just flops about. This, and the lack of any anti-skid feet on the under surface, makes desktop use less than comfortable: when the machine isn't skidding away from

you, it's lying flat so the screen is unreadable.

Changing the four AAA cells is a fiddle. You have to undo two tiny cross-head screws with a jeweller's screwdriver, which is provided. To change the backup battery you have to remove yet another, similar, screw on the main backplate. This kind of arrangement is OK for the backup battery, which will be replaced rarely, and probably at home. But the need to carry a special screwdriver in order to replace the main batteries in the machine is ridiculous.

Cross about cross-heads

The problem wouldn't be so bad if the screws used were ordinary slot-head. However, cross-head jeweller's screwdrivers are not easy to find even in the UK. Happily for foreign travellers, the Wordtank's German and French vocabularies include the words for jeweller and screwdriver.

The underside of the machine also features the two slots for the application cards (containing the two foreign language dictionary cards on the review machine). These are rather well designed, with a mechanism that prevents you inserting or removing cards with the power on. An eject button must be pressed to slide a card out and there's a nice solid 'click' when you insert one. The card label is clearly visible through a small window.

The keyboard could be rather more accurately described as an assortment of keys. Eleven on the top half of the case, just below the screen, select the

different applications or modes. The bottom section features a 45-key qwerty keyboard — a nice idea, except that the space bar has been relocated to a single key next to ENTER.

Above this is another panel with a selection of 11 keys, almost all of which are different shapes: a large round one for ON, two smaller round ones for OFF and CLEAR; a couple of small rectangular keys for CONTROL and a duplicate ENTER key (which unlike its qwerty partner can be shifted with the CONTROL key to toggle 'symbol' mode); finally there are four larger rectangular cursor keys, and two triangular buttons which select the search functions.

This keyboard proved to be about as confusing as you can get. I kept using the search keys for cursor control and the cursor keys to move to the next record. The curious size and placement of the space key mattered less because the Wordtank is designed to be held in your left hand and you press the keys with your right.

The logo above the Wordtank's screen declares that it's an 'intelligent dictionary', and even without the optional foreign language cards supplied for the review machine, it's capable of some entertaining tricks. Pressing the DICT key in the application keypad below the LCD screen selects the dictionary application. With no extra cards installed, this is restricted to what Canon describes as 'UK English'. Two mode keys to the left of the DICT key function only in the dictionary application. Mode 1 selects the dictionary, while Mode 2

selects between the three options: conjugating verbs, finding synonyms and listing word endings. There is no separate selection for spelling, since that can be checked in any of the modes.

The specification for the English dictionary is impressive for a handheld device. The spelling and hyphenation dictionary contains about 100,000 words, the thesaurus has about 50,000 entry words and more than 600,000 synonyms, and the machine can conjugate more than 8000 verbs.

Inserting one or more language cards brings the Mode 1 key into action. It now selects between English, French or German as the input language, and will either perform the same tasks as with English or translate between any of the two languages. The vocabulary is impressive, with more than 30,000 entry words and 60-70,000 translated words in each language. It's difficult to provide an idea of the usefulness of that size of vocabulary, but I was able to find the German and French versions of *arteriosclerosis*, *dietetics* and *porpoise*.

However, there were glaring omissions. The machine could translate *alternator*, *gearbox* and *windscreen*, but didn't know the German or French for *puncture*. But the dictionary does contain a remarkable number of diseases and ailments, something that could be of particular benefit to the traveller.

'U' turns

Entering words in German or French raises the problem of accented letters — attempting to translate the word

Canon Wordtank

Processor

Canon proprietary

RAM

32K, 1.5Mb ROM

Keyboard

67-key, qwerty

Screen size

20 characters by 7 lines

Bundled software

English language dictionary, diary, text editor, database

Price

£152.34

Supplier

Canon 081-773 3173

Good Points Good, comprehensive dictionary/translator.

Bad Points Primitive organiser functions. Confusing keys.

Conclusion Good portable dictionary.

(A full range of specifications for all the machines in this Group Test appears in the table on page 202.)



tümmel from German, for example, will drop you into the spelling menu if you leave out the umlaut on the 'u'.

Although the Wordtank aims to provide the other features that we've come to expect in an electronic organiser, they fall a long way short of the sort of thing we've come to expect. For example, there's a calendar and scheduler, but no clock or alarm facility, and in order to list your schedule for today, you have to enter the date manually. The calculator is of the floating point variety, but it does overflow: if your result is more than ten digits, it gives an error. The telephone directory is as simple as it could be: a flat-file database with no extra features like automatic international calls or DTMF dialling. The memory capacity is not spectacular either — just 32K internal RAM.

The documentation for the machine comes in that well-known class best described as 'adequate but embarrassing'. The manual is translated into real — as opposed to Japanese — English, but we're treated to some 'humorous' introductions to each section: Mr Cooke & Mr Darwin feature in one, and a Mr Humphrey (sic) Dumpty in the Scheduler. By the time I'd reached the antics of Messrs Sherlock Watson and Dante Shakespeare in the calendar section, the joke was wearing a little thin.

Losing patience

The Wordtank is a very capable attempt at an electronic dictionary, especially when the multi-lingual add-ons are included. However no-one used to one of the older electronic organisers

would be satisfied with the Wordtank's other functions — it's less useful than my old Psion Organiser II, in most respects. While the machine has a reasonable battery life at 250 hours, the poor battery access is a major flaw. But it was the keyboard that finally caused me to lose patience: if they'd left out the organiser functions and concentrated on making the keyboard and layout more user-friendly, this would have been a much more useful machine.

David Morton

Casio SF-7500

Residents of Fernando de Noronha must be must still be recovering from the shock. They're finally on the map. This tiny island off the coast of Brazil, though next to impossible to find in an atlas, is actually included in the list of international time zones in the 'World Time' function of the even tinier but feature-packed SF-7500 Digital Diary.

Success story

Casio, established in 1957, has been around longer than most realise — and with sales growing by 10% in the 'difficult' trading conditions of 1991, it is another example of the kind of successful Japanese company the UK industry can view only with awestruck impotence. Known mainly for its watches and calculators, Casio also targets the consumer market with its LCD televisions, musical instruments and various other electronic paraphernalia, as well as its range of digital diaries.

The 64K SF-7500 reviewed here is one of the smallest in Casio's range. It's shirt-pocket size, with the footprint of a fiver — less than half the size of the manual. Dinky and, at 147g, very light, the SF-7500 certainly meets the initial portability requirements for this type of device. If it's too bulky, you just don't take it with you. If you don't take it with you, you don't use it.

Flat keyboard

Opening the catch at the front of the Casio's black plastic case allows the machine to be opened wallet-like and laid on the desk. The hinged top half contains a 6 x 40 character LCD monochrome screen, plus function keys, cursor keys, on/off buttons and contrast control. The bottom half houses the flat qwerty keyboard, a tiny serial port (complete with rubber bung) and three lithium batteries. These batteries, two main and one backup, are replaced by removing the back cover with the aid of a screwdriver. Hidden alongside the batteries is a reset button. There is no provision for add-on cards for applications or memory.

Casio photographs show the SF-7500 with the screen angled, but there is no means of keeping the screen propped up to help viewing. This is irritating, noticeable immediately in use. The LCD screen, when angled correctly, is quite clear. It's also larger and can display more data than the screens on many bigger palmtops. A menu-bar highlights the current mode of operation.

The keys on both 'halves' of the machine are of the same zero move-

Casio SF-7500

Processor

Casio proprietary

RAM

64K

Keyboard

81 keys

Screen size

32 characters by 6 lines

Bundled software

Database, calendar, text editor, world time, calculator

Price

£85.10

Supplier

Casio 081-450 9131

Good Points Tiny.

Bad Points Clumsy software.

Conclusion Unfriendly but portable.



ment pressure-sensitive type. At first these appear dreadful, with no positive feel and almost no room to place your fingertips. But you get used to them, and they feel better still when you turn on the keyboard 'beep' to provide some feedback. Nevertheless, data entry is slow.

If the physical interface (screen and keyboard) is tolerable on these minifilofax machines then each stands or falls on the software quality: features and ease of use. The Casio software has plenty of features but could be easier to use. The features, all called up by their own key, are: Telephone Directory, Business Card Library, Schedule Keeper, Memo Mode, Calendar, World Time, Password, and last but not least, Calculator. The latter is excellent because of its giant, half-inch characters and its ability to do date calculations.

The 'World Time' function allows one of many world cities to be selected to provide a press-of-a-button foreign time check. This means spot-on accuracy when waking up overseas colleagues at '5am, their time'.

The Calendar and Scheduler work together, as indeed they ought, and their data entry, edit and search utilities work in much the same way as the 'Telephone', 'Business Card' and 'Memo Mode' features. Data is entered against a series of prompts. Enter an appointment using the schedule function and it will appear when viewing the calendar. Two months can be viewed side by side, a nice feature, and appointments come with am/pm indicators. Alarms can be set for daily calls or particular meetings and the sound can be turned on or off for either type. Non-working days can be highlighted and working days can be counted.

Memo Mode allows free-format data such as action lists or timetables to be entered in a similar way to other data, but with no prompts.

Duplication

The Telephone Directory and Business Card Library seemed to me to be unnecessary duplication. Why store similar data in two dissimilar forms? Name and address details can be retrieved using a number of different search methods. These allow good access to your data, but entry and retrieval was clumsier than with some organisers I have used. I found myself constantly referring to the manual (which was easy to follow) to remind myself of something I thought I had just learned.

Daftest aspect was that you could not search across groups of data. A name and address entered in the 'Telephone' mode could only be retrieved

Paper-based organisers

Do none of these machines do quite what you are after? Have you considered investing in one of the wood-pulp-based organisers that inspired the devices in this test? Conventional organisers have advantages:

- They are much cheaper. You can get a vinyl Filofax starting at £19.95, including VAT and a range of pages. Even the top-of-the-line Carmarthen Filofax (a 'fine calf-leather wallet with riveted corners in 12-carat rolled gold and concealed fastener') costs just £152.25 empty. Filofax has now discontinued some of the pricier (and sillier) wallets such as the Real Ostrich-skin — left-over ones are available for £125 (originally £325).
- They have a familiar, flexible pen-based interface. Users are not restricted to separate programs: you can put graphics into your telephone database, for example. You can examine as much data as you like side by side simply by removing pages and laying them out. Once data has been stored, it can normally be easily retrieved, even by novices. Data can be backed up using a photocopier, sent along phone lines using a fax, and shared with others (by tearing sheets out and handing them to someone).
- Although they are usually not much larger than electronic organisers, data input is faster. Handwriting speed is around 30wpm, while using the cramped keyboards of many electronic organisers can limit you to 20wpm or slower.
- They never run out of batteries, and they have no keyboard or screen to break or wear out. If they do go wrong, they are easy for even non technicians to repair or replace (often, it is cheaper just to buy a new wallet).
- There is a huge variety of sub-£5 inserts for them, including many features electronic organisers cannot duplicate. You can get maps of anywhere from Tokyo to Epsom & Ewell, guides to GCSE Biology, rulers, change-purses, credit-card holders, a Discover Your Colours guide, a Guide to Green Living, a rail map of New York, New Jersey and Connecticut and magnetic versions of dominoes, backgammon, Scrabble, draughts and solitaire. You can even get a 32-page spelling checker.

in that mode. Had it been entered as a 'Business Card' your search wouldn't find it. You have to know where your data is before you look for it. Users with more than one brain cell will probably avoid one of these modes altogether.

Nice features were the graphical 'memory used' indicator, password data protection, the ability to display some fractions as single characters, and the resume feature which brings you back where you were before power-off.

The SF-7500 also has communications. The serial port gives access to an IBM PC, via a separate cable and software package, and this is essential for backing up your data. You can even network to another Casio.

You can't accuse Casio of not stuffing as much as possible into this tiny black box. It's certainly small and it works. My reservations are all to do with ease of use: for all its sophistication I wonder if this data dictionary would really make your life easier.

Nick Edmunds

Casio SF-9500

The SF-9500 is Casio's top-of-the-range pocket computer. At just under £150 ex-VAT it isn't cheap by Casio standards, although it comes in well under

products like Psion's Series 3.

So it should. Don't get me wrong: I would buy one, but it hardly qualifies as a 'pocket computer'. Casio shouldn't mind me saying that because the 9500 was never *intended* to be used as a pocket computer. The '64k Digital Diary' legend, alongside the screen, says nothing that would upset the Trading Standards people.

Not for notes

There are machines in this test that you can use to take notes in a meeting. The 9500 isn't one of them. The smallness of the keyboard is a problem in itself, but it's made overwhelmingly worse by its peculiar SHIFT key. Unlike a conventional shift key, this has to be pressed and released *before* you press the letter you want shifted. Like the other keys, it doesn't always make contact easily. I found that after a while, I could type quite quickly on the main section of the keyboard, but I never got used to that SHIFT.

The Memo program, which is the nearest you get to a word processor, has no word wrap, is constantly in overstrike mode, and has a 'document' length of 384 characters — enough to jot down a few ideas, but no more.

Still, as I said, that isn't what this beast evolved to do. The 9500 is designed to provide sophisticated time management and organisational facili-

ties, and for the most part it succeeds.

The basic machine is made up of eight parts, although two pairs of functions are really aspects of the same thing. Keys on a custom 'menu bar' are assigned to Tel, Business Card, Memo, Schedule, Calendar, Home Time, World Time, Cal and Card. All pretty sensible. The first key on this custom 'menu bar', however, is labelled Display Change. Right. If Memo gets you into Memo, Tel puts you in Tel, then Display Change must get you into Display Change, allowing you to customise the display, perhaps?

No. It changes the display in some of the modes accessed by the other buttons. In Schedule mode, for example, it changes from a graphical display of your appointments to a list of the appointment details. I marvel at the ability of designers to produce new approaches to making software as difficult to use as possible.

Flawed software

The interface isn't the only flaw. The software, particularly the Calendar application, has some serious limitations. A fundamental feature of this is the ability to mark dates; not just single dates, like Bank Holidays, but for repeated dates. Every Sunday is no problem. What you *can't* get is the 21st of the month, or the last day of the month, or the last working day of the month, or every 28 days, or any other salary payment scheme I've ever come up with. Some people just don't realise what's important to most people...

The Alarm suffers from a similar

lack of flexibility. You can attach an alarm to a scheduled event and you can have a daily alarm, but you can't have an alarm that goes off every workday at 10am, and one at 6pm and...

For most people, the functions that come as standard will be as much as they ever need: 64K is a surprisingly large amount of RAM for unformatted data, but the average user may find the ability to add another 64K into the IC card slot useful.

Functionality

A more interesting alternative is to use the IC card to add functionality. We were supplied with two cards, on a similar theme. The better of the two was a multilingual dictionary which translated between English, Spanish, French, German and Italian. The English dictionary and the thesaurus on the second card were a little too... colonial, shall we say?

What I'd like to see is a half-decent word processing application on an IC card. Admittedly, 64K would be used up a lot more quickly but I suspect you'd want to transfer your notes to a PC long before you exceeded the 6000 words or so you'd get into the memory.

Easy PC connection, using the optional Datalink software and cable, is what makes the SF-9500 really useful. It's all pretty simple: a stereo 3.5mm jack plug goes into the Casio and the other end plugs into the PC serial port (25-pin, or 9-pin using the supplied adaptor).

It works, too. I know. I wrote the first 400 words of this review using the

Memo program. Don't ask me why; it seemed like a good idea at the time. Then I copied it across and used the built-in conversion utility to turn it into a Word file (ASCII, WordPerfect, dBase and SideKick are the other options).

If you don't want to go to the PC before printing, you can print directly to a serial printer using the Datalink cable, or more conveniently you can plug a Centronics cable directly into the SF-9500.

As with most pocket organisers, battery life is impressive. The three lithium batteries give 75 hours of operation and 13 months of data storage with the organiser inactive.

Flexible gadget

If you want a pocket computer, the SF-9500 is most definitely not what you want. If you want an expensive but flexible alternative to a diary, address book and calculator, it may just be the gadget you're looking for. If you want a replacement for your Filofax, buy another Filofax. This machine will supplement, not replace, the ultimately flexible form of portable information management — paper.

Guy Swarbrick

DIP Pocket PC Professional

I've had an Atari Portfolio, the badged version of the DIP Pocket PC, since July 1990. It hasn't worked since water leaked into the expansion port last year.

Casio SF-9500

Processor

Proprietary

RAM

64K

Keyboard

60 keys

Screen size

32 characters by 6 lines

Bundled software

Text editor, calendar, calculator, world time, database

Price

£148.94

Supplier

Casio UK 081-450 9131

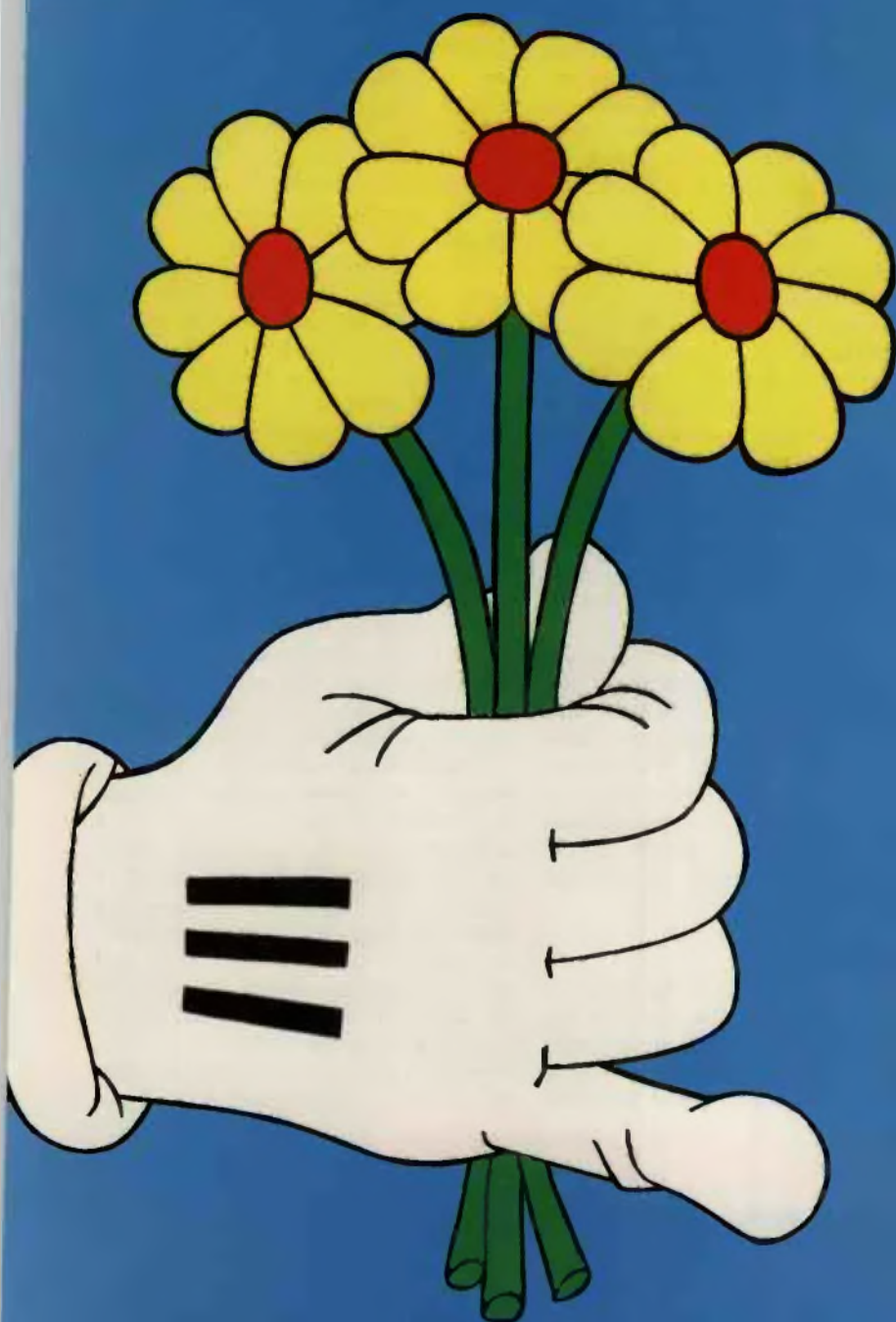
Good Points Powerful, flexible, long battery life.

Bad Points Not hard to use, but harder than it needs to be.

Conclusion What it does, it does well.



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Now I'm writing on PCW's loan machine, the Professional Pocket PC, and it seems like I never stopped. If my old machine didn't appear so trodden-on and damp, you'd be hard put to tell the two apart.

A year of technological advance has passed, but DIP has kept this design in rock-solid stasis. Its 256K ROM is still the strange hybrid of MSDOS v2.11 core with pocket organiser extensions. The 80C88 processor hasn't changed, or upped its speed (8MHz, I believe). It's kept the dinky little 8x40 LCD screen, and 128K of RAM. True to its name, it still fits (with a push) into a jacket pocket, and weighs just 1lb. And it's still got the rubbery qwerty keyboard that's fractionally too small for touch-typing. All that has changed, essentially, is the packaging.

Lost Atari label

Rather than the cardboard box the Atari version was sold in, the Professional comes in a plastic mock briefcase that I wouldn't be seen dead with. You also get a parallel port interface with a file-transfer utility, a 128K RAM card which pretends to be a DOS disk in drive A, a few ROM card utilities, a mains adaptor and improved manuals. The machine has also lost the Atari label, which looks to be how DIP and Pocket PC owners like it. Complaints about Atari's technical support are rife: DIP itself, while a much smaller company, has a high reputation among handheld companies for technical support. At least two of those companies, Sharp and HP, sell DIP-designed machines.

Operating the machine is a cinch to

anyone with PC experience. You pop in the three AA batteries, undo the flip-top lid, make a snap decision of language (English, French or German), and bang, you're astride the C> prompt. The 128K of RAM is divided on boot-up into a 32K RAM-disk, some DOS scratchpad RAM, and about 80K of transient program area. The RAM-disk can be reconfigured using an imitation FDISK command.

RAM expansions for the 128K version are available, but the packs look silly (two expansion packs double the length of the DIP) and would be cumbersome to use anywhere but on a desk. There are two ports on the machine: a RAM-card drive on the left, and a general purpose expansion port on the right. The RAM-card drive is not PCMCIA compatible, contrary to expectations — including, it appears, those of the DIP people, who supplied an unusable PCMCIA pack with the review machine.

The DIP appeared before the standard was finalised, and although it's damn near spec, you'll need a £50 box to use PCMCIA 2 cards. DIP has no plans to change the port design, which seems an oversight. The expansion port is a 64-pin connector which approximates to an XT bus but (as per the Pocket PC philosophy) doesn't seek out-and-out compatibility.

Peripherals

This port gives the DIP a slight edge in the range of peripherals. Possible expansions (barring the supplied parallel interface) include a £47 serial add-on, a £350 3.5in drive, radio and standard

pocket modems starting at £200, a fax, data samplers, a DMM measurement logger, bar code and ISO magnetic card readers, and a Hewlett-Packard Interface Loop adaptor. The port is hidden behind a clip-on cover. Exhaustive proofs show this not to be waterproof. There's also a concealed biro-driven reset pad on the underside, and a socket for the supplied 6V mains adaptor on the side.

The processor is the 8-bit 8088, as used in the original IBM PC. Downloaded PC clock tests show it to be running at around 110% the speed of that machine. The 256K ROM contains such elements of DOS and BIOS to make text programs run, plus a few extensions for the PC's extra capabilities. It includes battery-saving code. The PC will shut down after a few minutes idle. Processor states are saved, so pressing a key will return you instantly to your application.

The rest of the ROM is taken up with the on-board utilities: an address book, calculator, diary, text editor and a Lotus spreadsheet. All are useful, if perfunctory, with little to write home about.

The address book has the ability to tone-dial telephone numbers through the Pocket PC's speaker, which is more useful than it sounds; the diary can be set to ring alarm bells for one-off or regular occasions; the text editor has search/replace and word-wrap facilities, and the spreadsheet can load and run most non-macro Lotus spreadsheets (it misses a few functions). All except the spreadsheet use ASCII readable data files, allowing easy importation to larger PC applications software. A PC-com-

DIP Pocket PC Professional

Processor

8MHz 80C88

RAM

256K ROM, 128K RAM (128K RAM card with Professional)

Keyboard

63 keys

Screen size

8 lines of 40 characters

Price

£399.95

Suppliers

DIP (0483) 301555

Atari (0753) 533344

Good Points Easy to use, well supported.

Bad Points Jack of all trades. Expensive from DIP.

Conclusion For your friends, no. For PCW readers, good.



patible version of the ROM comes on the supplied 3.5in disk.

Mass storage is on RAM-cards (64K-1Mb), made by DIP and second-sourced by a German firm. The lithium batteries last for around a year, making back

What Car? up vital — probably through the DIP's built-in file transfer utility. PC transfer software is provided with the machine, with Mac and ST software available separately (cost: £60 each). The files are sent via the DIP's and a PC's parallel ports. The data is sent serially to allow PCs without bi-directional parallel ports to manage it. This slows the transfer down to around 2400 bytes per second. Given the small amount of data flow that would actually take place (how much do you type in a day?), this is acceptable, if a chore.

The Portfolio's DOS compatibility should be taken with a salty pinch. Apart from .BAT files (which work fine) DOS programs that can run on the DIP unaltered are the exception rather than the rule. Most would have to be custom written, albeit with very few changes.

Movable window

I've kicked a few text utilities such as Debug and Qedit up first time, but that's it. Even if the lack of low-level compatibility (the keyboard and the screen function very differently) doesn't get an application, the 128K RAM limit will. Curiously, the 8x40 screen isn't that much of an issue, thanks to a feature that allows software emulation of a mono text adaptor. In this, the DIP screen acts as a movable window on an 25x80 display. This proved to be usable

on the applications I got running, if wearing on the batteries (it demands more screen refreshes than using the built-in software).

The best use of the DIP's DOSishness is in programming small custom programs. Standard PC compiler output can be used, and the code can be debugged on a standard PC. Detailed technical information is readily available, cheap (£25), and for PC programmers, easily assimilated. Facilities like the tone-dialler and screen handling are supported by the BIOS, so programs are small and easy to hack up. I've seen shareware programs for plotting functions (the DIP screen can be programmed to address 320x32 points), running small animations, driving a BASIC interpreter, playing TETRIS, emulating a VT100 and more.

Hard-sell success

The hard-sell tactics of pre-recession Atari means the Portfolio has sold well — Atari claims around 300,000 worldwide. The largest sales went to companies in small vertical markets who value the low development costs, and PC users who aren't afraid of coding when they have to.

The technology is a bit trad for toy buyers, a little too non-specific for the organiser market, and the PC compatibility isn't enough for the aspirant notebook fans. But for the two established markets — programmers and enthusiasts — I see no reason why the DIP should not continue to please. My DIP, when it went into the palms of the almighty, was sorely missed.

Dan O'Brien

GRiD M88

Tandy, the American electronics giant, owns Victor Technologies, a long established British company that many will remember as the importer of Chuck Peddle's Sirius '3rd Generation' computer in 1982. Victor owns GRiD, which is lesser known because it concentrates on niche markets, making ruggedised laptop PCs for government-type use.

The GRiD M88 is a handheld designed purely as a suitable basis for building a wide range of specialist portable applications. Measuring 400x85x45mm it could hardly be called pocket sized, but the shape of the case and an elastic strap allow it to be held comfortably in one hand. The square display, at the top of the front panel, tilts slightly to make it easier to read.

The keyboard is divided into two sections. At the top is an area of relatively small keys in alphabetic order, with function keys across the top. Below this is a nice large-keyed calculator-style numeric pad, which makes entering numbers easy. Even the small keys are large enough not to be fiddly, though the non-qwerty layout rules out normal typing.

Doubling up

The SHIFT functions of symbol keys were unlabelled. Worse, functions like SPACE and the cursor keys were doubled up, and needed a special function key to access them. This key was positioned in the top-left corner where it could easily be operated by the thumb

GRiD M88

Processor

4.9 MHz 8088

RAM

640K

Keyboard

50 keys

Screen size

20 characters by 15 lines

Bundled software

Communications

Price

£999

Supplier

Victor 081-897 6565

Good Points Very PC compatible, powerful basic specification.

Bad Points Large. Minor ergonomic problems.

Conclusion Solid and boring — a safe bet.



of the hand holding the unit — assuming a right-handed user. In practice, of course, the programmer will decide the function of each key and the construction suggests that provision has been made for fitting totally different keypads.

The screen can display 15x20 characters in normal mode; an 8-row mode with double-height characters is provided for compatibility with earlier models. Backlighting with automatic or manual operation makes the screen easy to read in the worst conditions I could contrive.

Construction

The unit has an industrial feel to it: no-nonsense chunkiness. However, the sharp edges to its plastic case will reduce its strength under impact, and the display lens is soft and exposed to abrasion damage. I suspect the unit can withstand reasonable knocks, but I expect more from GRiD.

The M88 comes with serial and bar-code reader interfaces built in, their sub-miniature DIN sockets being found under rubber plugs near the top of the case. A bus connector hides behind a large plastic blanking plate covering the top rear quarter of the unit. Expansion modules, such as a printer or modem, would replace the whole plate when fitted.

Power is normally provided by a special 4.8v NiCad battery pack which can be replaced by four penlight cells if required — useful if you are stuck in the middle of nowhere and your battery goes flat. The M88 can also draw power from pins on the serial and bar-code interfaces if required — it's not too fussy about the voltage.

Inside the unit is a CMOS 8088 processor and 640K of program RAM. The unit is designed to be PC compatible as far as possible, including an IBM compatible display and keyboard.

Mass storage is provided by GRiD RAM-cards — 128K on the review model but other sizes are available. Connection is via a 38-pin socket along one end, which sounds like a recipe for bent pins. Fortunately a well-designed insertion mechanism and extraction lever seem to make them immune to the most hamfisted operators. The M88 has space for two such cards, which slide in under the keyboard.

Interface cradle

One outstanding feature of the GRiD system is an interface cradle, from which the M88 can communicate via a standard serial and parallel port on one side — connected optically. Even more interesting is the battery charging.

Power is transferred to the M88 using an induction loop. An interlock prevents charging if alkaline batteries are fitted but automatically takes care of NiCad charging.

This lack of electrical connection with the cradle would allow the M88 and cradle to be completely sealed. The current versions are definitely not waterproof (splash-proof possibly) but you can forget about dust contamination.

The cradle can run off any 9-12v power source — a vehicle battery is a possibility — and also has space for penlights or a NiCad pack of its own.

Several of these cradles can be networked and connected to a common modem or host computer. This allows some interesting applications to be developed where several M88s could be used in the field by day, and their data collected simply by dropping them back in their cradles overnight.

Operating system

The M88 is PC compatible with a special BIOS. It runs MSDOS 3.22 out of ROM, with an internal RAM-disk being drive C. The RAM-cards (drives A and B) are treated just like floppy disks. Apart from MSDOS itself, the ROM contains the BIOS with pop-up keyboard utilities, configuration programs and so on. A built-in menu scans the RAM-cards on startup to generate a menu of executable programs and batch files in the absence of AUTOEXEC.BAT.

As well as the standard DOS bits, a communications program based on Mirror (the Crosstalk clone) is built in. I connected it to a range of different comms packages with no trouble. The Kermit server was particularly good, allowing me to batch download code.

Normal working

Unfortunately, a developer's manual was not available at the time of review but techies at Victor told me the M88 worked just like a normal PC. This turned out to be correct — just use your favourite PC development system and try not to overflow the smaller screen. You can scroll the physical screen around as a window on a 25x80 virtual screen but it is better for users if they don't have to.

I even tried attacking the video RAM directly and it seems to work. In fact, none of the metal bashing I tried broke the M88. The keyboard scan codes are the same as a normal PC and the low-level disk format matches. In order to poke around in the internals I sent a copy of Manx's sdb source/object level debugger down the serial line. Even this worked without a hitch.

The M88 costs more than the less

bulky Psion HC-100, which is aimed at similar niche markets. But being a no-nonsense PC compatible, is easy and probably cheaper to program. It also comes complete with built-in interfaces which are expensive optional extras on the HC-100.

A few rough edges remain in the physical design but the M88 could be a cost-effective host for a wide range of applications.

Frank Leonhardt

Hewlett-Packard 48SX

Two criteria determined whether a product was eligible for this Group Test. It had to be small enough to fit in your pocket and it had to be in some sense a computer.

The Hewlett-Packard 48SX qualifies, though it is considerably different from the rest of the pack. Unlike its second cousin twice removed, the 95LX, the 48SX is pure Hewlett-Packard, descended from a line which includes the illustrious 41C, carried by Shuttle astronauts to supplement the meagre on-board processing power.

The HP 48SX is a calculator. But it compares to the Casio job that got you through your O levels like a Vauxhall Nova compares to a Ferrari Testarossa.

For a start, the 48SX uses Reverse Polish Notation for calculations. To multiply two numbers you type '67 Enter 25 X' rather than the traditional '67x25 ='. Each number entered or calculated is put on to a stack which can be manipulated in sophisticated ways.

The 48SX can manipulate arrays, solve complex equations and plot graphs. The display is bitmapped and one of the less obviously useful functions of the programming language is the ability to manipulate the screen directly.

Great. But how did the 48SX get into this test? Well, the programming language makes it a quite sophisticated computer, even if the bias is toward scientific, engineering or mathematical use. The built-in Time application and the ability to manipulate text means that if you're perverse enough, you could use the HP 48SX as an organiser. Or worse, a project management tool.

Text blues

If some of the methods of data entry on the other organisers seemed a little odd, the 48SX has them all licked. A lot of it makes sense in the mathematical modes, but as a way of using a diary it defies belief.

COMPUTER
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EDITOR'S
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controller

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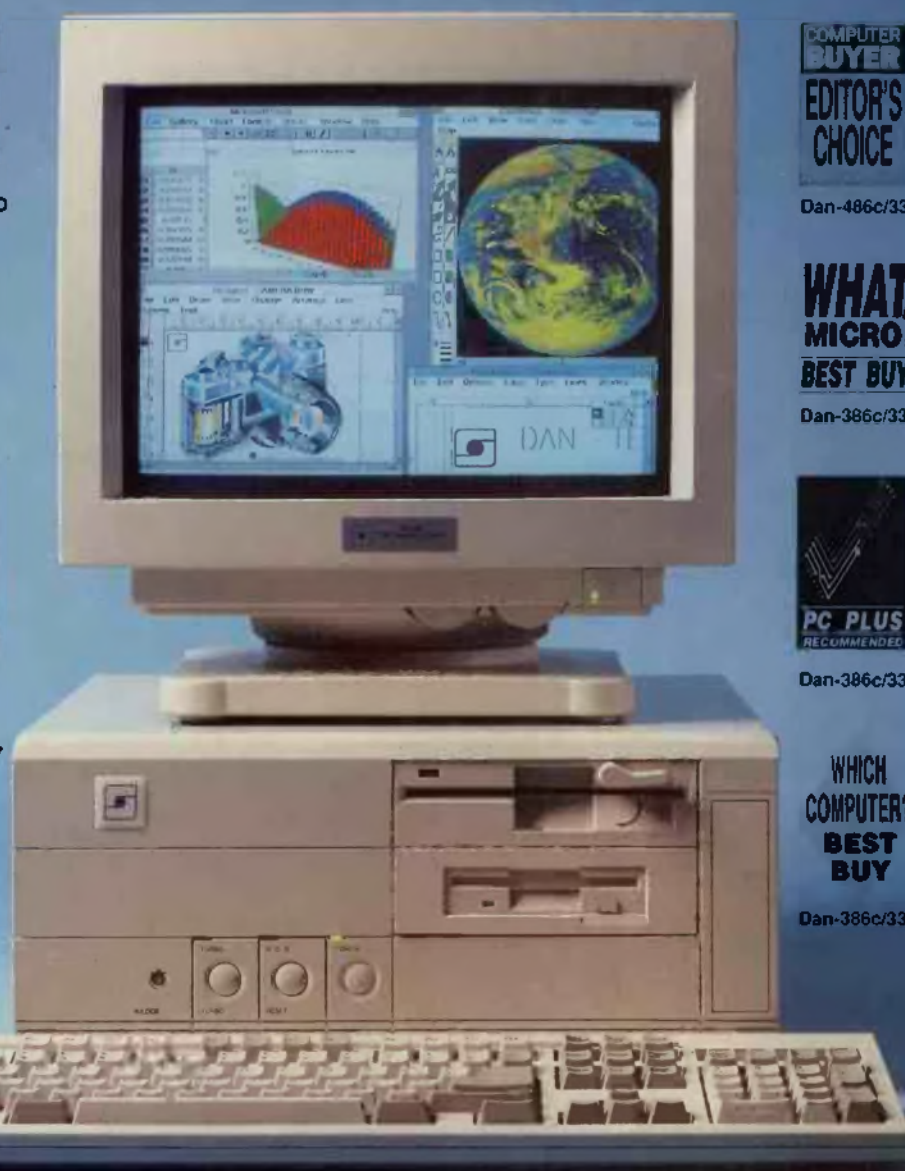
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PC TODAY
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Dan-286/20



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BUYER

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SPECIAL OFFER SYSTEM 4MB 130MB

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HP 48SX

Processor

HP Saturn (proprietary 4-bit)

RAM

30K

Keyboard

53 keys

Screen size

22 characters by 8 lines

Bundled software

Over 2100 calculator functions

Price

£287

Supplier

Hewlett-Packard (0344) 360000

Good Points Great calculator.

Bad Points Awful organiser.

Conclusion The only option if you need both.



Project management on a calculator isn't my idea of fun, but it is the first example the manual gives on how to use the time function. Imagine, as you are asked to do, that your manager has assigned you a project and wants a progress meeting in 30 days' time. Imagine, too, that using a calculator for project management is, at worst, half-way sane.

There are two Shift keys, a left-pointing arrow on an orange key and a right-pointing one on a blue key. They are essential to the plot. OK: let's work out when the meeting is due. Press *Orange Arrow*, *Time*, *Nxt*, *DATE*. The current date will appear in the form 4.011992; obviously, the 1st of April, 1992. Press 30 then *DATE+* and the due date, 5.011992, will appear. *Orange Arrow*, *Time*, *ALRM* puts you into alarm setting mode. The date you want is still on the top of the stack, so *>DATE* will set that; *9 >TIME* will set the appointment at 9am. *BLUE ARROW*, *"", PROGRESS MEETING TODAY, EXEC, SET* will complete the assignment.

Except it isn't quite that easy. To type the text, on the 48SX's alphabetical keyboard you need either to press the Alpha key for each letter, or *Blue Arrow*, *Alpha*, then the text, then *Blue Arrow Alpha*.

You can access the time functions from the programming language and you could, conceivably, write some sophisticated time management software of your own. The terrible A-Z keyboard, though, would probably ensure that you wouldn't use the software even if you wrote it. Clearly, you'd need to have uses for the

48SX's calculator functions (or some small part of its enormous repertoire which you can't find anywhere else — there are plenty of examples of such functions) to justify the £287 price tag.

Calculators with printers

One or two features could make the 48SX indispensable. You can, for example, buy calculators with built-in printers. Accountants love them. They're great for printing out rolls of additions and percentage calculations.

Imagine, though, that you'd just produced a pie chart, or a histogram, or the plot of a Bessel function on the screen of the 48SX. With the optional printer you can print out anything you can display on the screen; or the stack, to any depth. Or you can write programs that use it like a normal printer. The really neat thing is that there is no physical connection between printer and calculator.

The infra-red link that controls the printer also allows two 48SX's to connect to each other. This would have been a great calculator to take into exams: you could pick your neighbour's electronic brain.

Interface kit

Alternatively you can communicate with non-HP devices using the HP Serial Interface Kit, consisting of a cable with a proprietary serial connector on one end and a 25-pin D connector on the other, plus a single diskette with a copy of Kermit on it.

OK, it isn't the most sophisticated form of data transfer between a pocket computer and its desktop partner, but it

works. Given the poor quality of the keyboard, the most useful function is to allow you to write programs on the PC and then transfer them to the 48SX.

Two card slots allow you to add two 256K ROM cards or 256K RAM cards. Few applications cards are available but there are useful libraries of engineering equations.

The 48SX isn't easy to use but it is powerful. If you need the kind of power it packs, you don't have a lot of choice. But you'd have to be mad to choose this as an organiser.

Guy Swarbrick

Hewlett-Packard 95LX

First, a confession: I don't like pocket PCs. My pockets are never large enough as it is. I'm a bag man, and so may as well carry a bag-sized laptop with a comfortable keyboard and screen.

But if I were going for a palmtop, I'd be tempted by the HP 95LX. Cheaper machines can match its Filofax functions: appointment book, phone directory, notepad, and a slick image. But the 95LX adds a specification that would not disgrace a desktop PC: MSDOS (or a lot of it) and Lotus 1-2-3 (almost all version 2.2) on 1Mb ROM, plus 512K RAM and a 2Mb RAM-card drive. All for less than £400 if you shop around (though that 2Mb card will cost you almost as much again) and packed into a smart matt-black box little larger than a TV remote-control unit.

Moreover this is a remote-control

Refalo, the pen-based palmtop

Many palmtops are touted as basic electronic organisers. Kyocera is marketing its as-yet unreleased Refalo as an electronic Filofax. It's a ring binder with micro circuitry, using an LCD rather than pages — although you can use the rings to hold notes from a paper-based Filofax.

This looks like being the first pen-based palmtop to hit the streets, and it also has some other natty features. A 4mm thick non-qwerty keyboard the size of a Filofax page fits through the rings and communicates with the motherboard using induction technology — which means no wires or plugs. Kyocera promises other modules working along similar lines, including a fax card and a qwerty keyboard.

The 750g machine, already on sale in Japan, measures 190x144x42mm, giving it roughly the same volume as a well-filled Filofax.

An LCD screen takes up about a third of the left-hand inside cover. Alongside is a speaker, and underneath are a red power switch and some stylish cursor keys.

The six rings on the spine are crafted from black metal, and can be parted by pulling down two plastic clips. A long lithium battery runs down the length of the spine, backed up by a pair of AAA's in the right-hand cover. Also in this cover are two PCMCIA-compatible card slots.

The Refalo runs a 16-bit 9.54MHz NEC V30 processor, compatible with the 8086, although the evaluation unit only ran at 5MHz. The system software is based around Pageview, a pen-based Windowing language which fronts an extended version of MSDOS 3.22.

Handwriting

The most interesting thing about the unit is the handwriting recognition. You use a stylus to write on the pressure-sensitive display. Most letters and numbers are recognised, but the machine had problems with capital G's, S's and Q's, and small g's, i's, j's and q's.

Each letter must be written in its own separate box. This, combined with the slight inaccuracy of the stylus, means that writing directly onto the screen is not really feasible.

Apart from this, the system software is mostly adequate. It incorporates a word processor, an address database, a world-time function, a scheduler and a calculator. The word processor incorporates a simple drawing tool. Drawings can be incorporated into text files but the word processor itself can take only straight text input. Apart from a simple search function, there is

nothing like a word-count tool, and cut and paste is only possible using the clipboard in conjunction with the system tools menu, which was fairly clumsy on the evaluation unit. Even on a small personal organiser where other functions would be too fussy, these are essential requirements for a word processor.

The database was reasonably comprehensive although not exactly flexible.

There are five fields — Name, Title, Address, Category, Telephone number and notes. It would have been nice to allow a few more fields: email address, fax and portable phone number would have been nice. The categorisation feature is useful for distinguishing between, for example, contacts and personal friends. Any field can be used as the key field, and text fields can be looked up using a table of letters of the alphabet. A search function is also provided to find keywords.

Melody maker

The World Time function is well laid out — even prettier than that of the Psion Series 3. The time and alarm time is displayed using a big, stylish typeface, and the user is provided with an option to set the alarm on or off, and to choose from five different melodies, or a straightforward beep. Time in a certain city can be selected using a map of the world, or for a choice of more cities, a menu is provided. To help narrow the choice, you can select one of five major global areas first — Oceania, Asia, Africa, North America, Latin America, or Europe and the USSR (let's hope the final product is a little more politically up to date).

The Scheduler is another well laid-out function, providing a daily, weekly, monthly or three-monthly view of the schedule. The view can be changed with just one stroke of the stylus, which is useful: one common criticism of personal organisers is that they don't let you see enough of a schedule at any one time. Using the stylus, holidays can be set, as can intervals when something will happen (for instance, school play — Tuesday from 12:00 — 4:00).

The program lists as much informa-



tion as is possible within the given space. When a daily view is selected, that day's appointments are listed, while a weekly view shows a time scale for each day with busy times marked. A monthly view simply displays an asterisk beside days which contain an event. If you try to enter an event which clashes with an existing event, the program will warn you, but will list both events anyway.

The whole caboodle is run using the System Tools menu, accessed by touching a small screen icon. This also provides a function to copy a graph or file to or from the clipboard — why this couldn't have been included within the word processor or graph functions is not quite clear.

A memory size option shows you the total memory used and the memory used on the separate memory cards. A Setup function contains options to set the power-off timeout. You can also set up a system password, and calibrate the stylus response.

A control panel option lets you adjust the screen contrast, sound volume, key click, and a master lock, which only the password will circumvent. The other utilities handle file management and configuration of the comms port, but these were not functional on the evaluation model.

Pipedream

At a price estimated at 'under £1000', and with a release date undecided, it looks as though this machine may remain a pipedream for a while yet. If the price is higher rather than lower and the software isn't improved, then Kyocera may find it difficult to persuade even the most hardened yuppie to buy it.

Kyocera is on (0734) 311500.

Danny Bradbury

unit: it's got an infra-red interface, much like your TV switcher but allowing two-way communication.

Communication is what sets the 95LX apart. No palmtop is good for heavy keyboard input, particularly of text (though some swear by the Microwriter AgendA, also reviewed here). Most of the more expensive models compensate by allowing you to exchange files with larger machines, but none so comprehensively as the 95LX and with so promising a channel as an infra-red port. No messing with cables: just stick the palmtop near a sister port and let the infra-red do the talking.

Sadly, I had no sister to talk to, which points to a snag: IR ports, though not a new idea, are hardly common. But we are going to see a whole lot more of them if Xerox and Olivetti judge the future right (see page 246, and 'Pandoring to Big Brother', PCW March), and the 95LX could help them catch on in the meantime.

Still, the IR port is merely the icing on the 95LX's comms cake. There's a four-pin serial port and an 'optional' connectivity pack (£68), essential for serious use, with a cable and plugs for an RS232 link-up (beware: the 95LX end can be plugged in the wrong way). The pack includes a modified version of the 95LX applications to set up on a host system, offering some interesting possibilities which I shall come to later.

Hardware

The 95LX uses an NEC V20H processor, a clone of the Intel 80C88 but draining less power. The rest of the logic is on a single ASIC chip.

With the flip-top lid snapped shut, everything delicate is either well recessed or covered to prevent damage. On the right edge, a slip-off IR filter doubles as a cover for both the IR port (an LED and a sensor) and backup coin cell. Next to this are the tiny serial interface and an exterior power input — irritatingly, no polarity or voltage is marked.

At the rear base is the cover for the main batteries, two AA cells which HP claims last up to two months; I did not change them in three weeks of fairly intensive use.

On the left edge is the RAM-card drive, covered by a flap. Cards (PCMCIA 1.0 and JEIDA 4.0 compatible) are ejected by a sprung slider on the front edge of the case.

Design flaw

It's all very neat but there's a major design flaw, shared by other machines of this ilk. Lift the lid and you will see the keyboard is slightly recessed, leaving a rim. This totally disables half-way normal typing because it prevents you hitting the space key with the edge of your thumb. A recess on the base rim and a corresponding bulge on the lid would have rescued user-thumbs without destroying the dust seal.

The LCD screen in the lid shows only 16x40 characters but it can window a full-size virtual display: you move the window by ALT-ing the cursor keys. This means, in theory, that you can run CGA-friendly applications without modification.

Text-based programs I tried ran OK but a graphics-based game crashed the

machine beyond a soft reset (which preserves the RAM-disk data). Happily, a few bytes ominously labelled COMMAND.COM survived a hard reset and turned out to be visible ROM addressed as RAM-disk.

The keyboard packs full qwerty plus a number pad in less than six inches. I would have dispensed with the pad in favour of wider text keys, but that is a writer's preference: the 96LX, co-designed by Lotus, is a number cruncher.

All the important PC keys are available, albeit not all in familiar positions. The DEL and round-brackets keys replace three of the usual horizontal number keys. The first seven, suitably marked with icons, summon the in-built applications: Filer, Datacoms, Appointment Book, Phone Directory, Memo Pad, 1-2-3, and Calculator.

The F-keys on the top row are set into a template showing their 1-2-3 functions. Other applications cram a template on the bottom two rows of the screen, so you have to squint to see which item refers to which key. F1 always provides context-sensitive Help.

Two non-standard keys flank the space bar. CHAR configures keys for the more obscure members of the IBM and Lotus international character sets. It will also trigger a user-defined macro from each of the F-keys within 95LX applications — useful, because these have a few clumsy edges. Lotus 1-2-3, of course, has its own macro facility.

Obvious way out

A key marked MENU, actually the Lotus slash command key in disguise, calls up a menu relevant to the current

HP 95LX

Processor

NEC V20H

RAM

512K RAM, 1Mb ROM

Keyboard

80 keys

Screen size

16 rows by 40 columns

Bundled software

Comms, calendar, database, text editor, 1-2-3, and HP 19B2-equivalent Financial Calculator

Price

£449

Supplier

Hewlett-Packard (0344) 360000

Good Points Walks well. Talks well. Powerful.

Bad Points Rough edges in user interface.

Conclusion A potential trendsetter.



screen. This is sensible, avoiding a constant clutter of displayed options, but it breaks a cardinal rule of screen design: always give a user an obvious way out. You have to press MENU to find the exit, which is not at all obvious. The system works well when you get used to it, but it means you need a dip in the book when you first use the 95LX.

And the documentation is sketchy for a machine of this power. It looks good, because as well as a *Quick Start* booklet you get a fat *User Guide*. But this is mostly about 1-2-3. There is little technical information, nothing on using non-customised applications, nothing on developing your own, and little on file structure.

Applications

SHIFT-File accesses Setup, which allows you to specify date and time formats, language, and the size of the RAM-disk (the default is 254K). A two-tone bar indicates battery level. Setup also gives you a choice of Epson, Proprinter, and HP LaserJet drivers, though as you need a serial printer most users will probably print via a larger computer. An IR LaserJet port is available.

Filer itself is a basic shell, from which you can run applications and generally housekeep your files. It also provides a gateway to DOS.

The Appointments, Phone, and Memo utilities are fairly standard implementations, except that there is a clipboard to swap information between 95LX applications.

The 1-2-3 spreadsheet needs no introduction. There are extra zoom and

navigation facilities to allow for the smaller screen, which means macros from larger models may require modification. Missing are PrintGraph, Translate and the Macro Library Manager.

The Calculator is excellent, though awkward in places — you need three keystrokes to clear a line. There is a powerful Reverse Polish mode (see the 48SX review here). It will store an equation, graph it, and solve for any unknown. It will even swap data and results with 1-2-3 worksheets, accessing all the spreadsheet's power.

The communications software at first sight seems rudimentary. The Datacoms utility includes a smattering of script language for automatic log-ons, but it's too basic for anything ambitious (the serial port supports only the Transmit, Receive and Signal Ground pins so there's no hardware handshaking).

But confusingly, a powerful comms facility is hidden within Filer. F7, tagged Split Screen, accesses an adaption of Traveling Software's peerless LapLink. Use the Connectivity Pack software to mirror the 95LX facilities on a host PC and you can easily shuffle files between the two machines, either direct or via a modem link.

A merge utility effectively updates sister appointment or phone files, producing a single file with all the information from both machines — a feature that could prove indispensable.

File translation

Another utility translates files to and from Lotus Metro, SideKick, and Convention Data formats, or to PC Tools' Database format.

And there is a yet another useful way to link up. The Connectivity Pack includes LapLink stablemate DOS Connect, a TSR utility that allows the host machine to use the 95LX drives like they were its own. It won't run remote programs, but you can access 95LX files from within a host application.

The 95LX is already attracting software and hardware developers (you can even buy a clip-on GPS satellite navigation pack). It is easily customised for business applications, very well adapted for use with a larger system, and incorporates several good if rather disjointed ideas. The software needs ironing out, particularly the host suite: you have to consult the book to find out how to exit applications, and it would run only from drive C on an Amstrad 4386SX. All in all this could become the definitive palmtop business system, but it's not quite there yet.

Clive Akass

Husky FS2

Husky has been doing handhelds for a long time. It was one of the first companies to make 'go-anywhere' computers designed to be rugged enough for field use and small enough to carry without the aid of a truck. What is more, Husky is British.

The FS2 measures 236x128x44mm at its widest (the display), but it slims to a 70mm waist with a rounded back bearing a hand strap, allowing the unit to sit very comfortably in one hand.

The keypad is alphabetic rather than qwerty. But the alpha keys, small and

Husky FS2

Processor

8MHz 8086

RAM

1Mb of RAM, 128K of Flash EPROM

Keyboard

56 keys

Screen size

8 lines by 40 characters

Bundled software

PC link

Price

£1449 (£1249 for 512K)

Supplier

Husky (0203) 668181

Good Points

Easy to program.

Rugged, high spec. Easy to use.

Bad Points

No built-in disk.

Relatively expensive.

Conclusion

Reaches the parts other handhelds would die in.



square and set below the waist of the machine, are very much subsidiary. The number keys, large and round, are in the waist. This highly sensible arrangement lets you press the numbers and other strategic keys with the thumb of the holding hand, enabling true one-handed operation. Also, there is no obvious left/right-handed bias — the ENTER key is in the centre and each possible thumb has its own Shift key.

Click or bust

The buttons have a positive feel, but you have to do more than simply press them until their resistance goes. A second-stage click is needed before the key is recognised. This probably has the advantage of avoiding accidental keypresses but I found it a bit disconcerting at first. The layout is very well thought out. All the keys I tried to find were easily found, which has not been my experience with any other handheld.

The CGA screen is capable of displaying 8x40 characters in text mode and 240x64 pixels in graphics mode. An effective backlight lights up with a pretty cyan glow. The lens in front of the display is particularly well polished, leading to a few problems with reflections in artificial light. It is made of a polycarbonate material, supposed to be tough, and is recessed.

The rest of the case looks like it was designed for being painted khaki and dropped out of helicopters. It is beautifully cast magnesium alloy and painted a nice matt grey/green. Numerous recessed bolts hold the two halves together against a gasket which is designed to withstand a day in the pouring rain or submersion in a metre of water. The case is not rubber armoured (I don't see why it couldn't be) but should withstand a drop of 6ft or so.

Most contact with the outside world is made through two RS232 ports operating at a maximum speed of 38.4Kbps. You have the option of standard AT 9-pin D-type connectors or industrial Fischer-screw sleeved plugs — both types waterproofed.

Planned comms link

The machine's only other connectors are a charger socket, and two large charging contacts on the back for a charging cradle. A planned comms link will use a radio-frequency carrier, fed through those same cradle contacts, to dump data during overnight charging. No expansion bus is available by design, as any such external connections would be vulnerable to physical contamination; fitting something internally requires factory re-sealing. An external

floppy drive is available, which is serially connected via the same connector as the battery charger.

The unit is normally powered by three A-sized Ni-Cad cells. That's right, A-sized, not AA (akad penlight). I had never heard of them before but they turn out to be a non-standard size about 2mm thicker than penlights but the same length. According to Radio Spares (who don't actually stock them) the extra 2mm width just about doubles the capacity so they make sense. Three normal AA cells will function in an emergency.

The FS2 has a CMOS 8086-compatible processor running at 8MHz. The review unit had 1Mb of RAM, divided between DOS and a RAM-disk (drive C). You can decide how the RAM is divided by formatting the RAM-disk. Everything else about the hardware is also IBM compatible wherever possible. Basically, this means you will have to go to some trouble to write an application which fails to work on the FS2.

File transfer

MSDOS 3.3 is supplied in 128K of flash EPROM, including all the utilities and GWBASIC. This part of the ROM is mapped onto the RAM-disk as a write-protected \DOS subdirectory.

The BIOS has enhancements to deal with power management, and keyboard and display mapping. The FS2 supports a full-sized virtual screen which can be viewed in parts by the physical one: this includes graphics mode.

Although the COM ports can work in a PC-compatible way, BIOS functions allow properly buffered I/O and deal with handshaking, carrier detect and all the other things you wish IBM had included from day one.

Also in the EPROM is a utility for setting up the RAM-disk, serial ports and similar items, a full-screen editor and a communications program which can be used to transfer files to and from a host machine. Husky has an enhanced program called HCOMM for transferring to an IBM PC. This looks a lot like LapLink III in operation, and works just as well.

Although I had only a day to play with the prototype machine I had no problem writing working code. I was even able to download and run a source level debugger on it. The extra BIOS functions, well documented even in the draft version of the manual, are well chosen and should save a lot of hassle.

The rugged type

The Husky FS2 stands out for its ability to survive anywhere from construction sites to rain forests. It is well thought-

out and easy to program, though you must sacrifice fragile items like RAM-cards for ruggedness. It does cost more than any other machine in this review but there are good reasons.

Frank Leonhardt

Microwriter Agenda

The Agenda is not like other organisers. The first incarnation was released in 1980, long before the phrase 'personal organiser' was coined, and the machine has remained free of the conventions of the other organisers ever since.

In 1980, there was little more to the Agenda than its five microwriting keys. These fit under the fingers and thumb of the right hand, and are used in various combinations to produce the letters of the alphabet and a few punctuation marks. The idea came from Cy Enfield, a film producer who formed Microwriter Systems with financial backing from Sir Mark Weinberg.

The Agenda as we now know it wasn't released until 1989, when the alphanumeric keys were added and the design revamped. It has changed little since then and retains the original lozenge shaped design despite criticism that the screen is too small.

The microwriting keys lie naturally for the right hand: the four for the fingers are arranged in an arc around the tiny alphanumeric keys, with the thumb key set slightly apart and to the left. The function keys are on the left, under the LCD.

The 1x2in screen holds 4x19 characters. The displays are readable but lack flair. No doubt, Microwriter Systems is reluctant to change the design that won it a Design Award in 1990.

Chunky and solid

The Agenda has a chunky, solid feel without being too bulky to carry around. It measures 175x85x20mm and weighs 275g. The battery recharger is the size of a large plug and can be used to power the unit with no danger of overcharging. The battery is expected to last for around 40 hours of operation, and I am reliably informed that it has been rugged enough to endure a trip to India.

Along the right-hand side is a port for a printer or computer, the socket for the battery charger, a charge indicator, and the on-off switch. Two slots for memory cards or applications are on the underside.

A Hitachi 6303 processor clocking 4MHz controls the operations. It's fairly

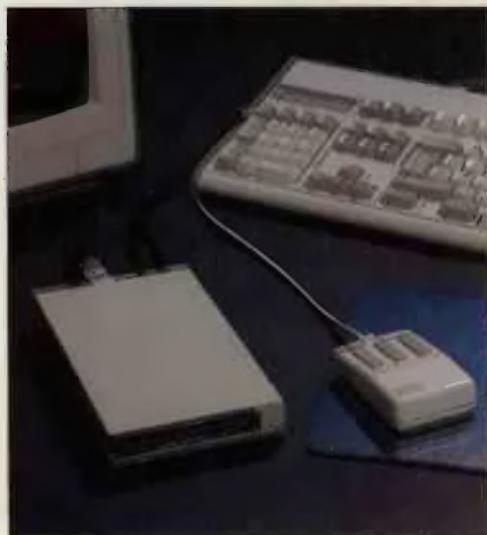
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- | | |
|------------------|--|
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| > RAM | 4Mb |
| > ROM | AMI and Phoenix VGA |
| > Hard disk | 60Mb |
| > Floppy | 1.44Mb, 3.5" |
| > Keyboard | 102-key |
| > Monitor | SVGA 1024 x 768 (16 colour) interlaced |
| > Std Interfaces | printer, serial, PS/2 keyboard and mouse ports, exp. connector |
| > Size | 204 x 124 x 25mm |
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Microwriter Agenda

Processor

4MHz Hitachi 6303

RAM

32K or 64K (128K pending)

Keyboard

Five microwriting keys, plus 59 function and A-Z keys

Screen size

19 characters by 4 lines

Bundled software

Diary, text editor, calculator

Price

£149 (or £199 for 64K version)

Supplier

Microwriter Systems 071-493 8111

Good Points Microwriting. Easy for non-techies.

Bad Points Lack of features.

Conclusion One of a kind.



slow — a sign that perhaps the Agenda has become a little out of date. The machine comes in 32K and 64K versions, with 128K on the way. Unfortunately, there are no plans for updating the processor.

Microwriter Systems has its own operating system, with software for converting the files to PC or Mac format. I expect this won't matter much to many Agenda users because unlike fans of rival machines they are not technically minded. They want a portable diary and notebook, rather than a substitute computer, and at these simple tasks, the Agenda is very good.

It is basically a database, diary and calculator. Word processing features have been added to the file creation mode so that the general database can be used for text files, as well as addresses and contacts.

The software centres around a Start Menu offering three options: New for a new file, Find to search the files, and Diary to make or view entries in the diary. At any point, pressing Start will bring you back to the Start Menu. The system is easy enough for the non-techie, but computer enthusiasts may find it aggravatingly basic.

Powerful Search facility

The Search facility is one of the Agenda's most powerful features. Files are by default given in chronological order, with the last created or last edited first. Alternatively, they can be sorted into alphabetical order, or searches can be run for all files containing a particular word or phrase. The

Agenda searches as the word is typed in and usually locates the correct file within two or three letters.

This facility is especially useful in identifying groups of files. By running the search on a common feature, such as the town 'Bedford' or the word 'solicitor', all entries can be found on that subject. In these examples, all contacts in Bedford and all references to solicitors would be identified.

The Diary is accessed separately and is slightly less intuitive. Alarms can be entered with the appointment information and can be set to go off daily or weekly at a certain time. There is also a calculator.

The Agenda is remarkably easy to use. The manual explains everything down to what a 'file' is. Patronising, but clear.

Microwriting

Many of those who love the Agenda love it for its microwriting. The key combinations are based on the shape of the letter, so that visualising the letter can remind you which buttons to press. Most people can pick up a few letters in a minute or so, and after half an hour I was looking at the alphabet card only occasionally.

There is no left-handed version yet. Microwriter assures me it has found no need because left-handed users find the Agenda no harder than using a qwerty keyboard.

Extra software is available on add-in cards. It includes a financial calculator, a spreadsheet, a translator (between English and French, German or Span-

ish), and a set of utilities. A fax modem has been developed specifically for the Agenda, and software for integration to Windows is to be released shortly. Also available are 32K, 64K or 128K memory cards.

Numerous legends surround the Agenda. I met one user who claims to be able to microwrite accurately with the machine in his pocket. Another told me the Agenda was invaluable when he was in hospital and could use only one hand. For those who love it, there is no substitute.

Then there are those who hate the tiny screen, refuse to learn to microwrite, and curse the lack of features. The Agenda may not be keeping up with the changes in the electronic organiser market, but then half of its appeal comes from the fact that it has always remained slightly aloof.

Helen Johnstone

Poqet

The definition of what constitutes a useful computer has changed since the Poqet was launched 18 months ago as the world's first full MSDOS pocket machine. Few people would consider a 7MHz 8088-based machine as a 'real' computer. Windows won't run on anything less than a 286 and most big companies would buy nothing less than an SX, which means that while the Poqet is data compatible with your desktop PC you are unlikely to want to run the same versions of your applications on both.

Poquet

Processor

80C88 up to 7.0MHz

RAM

640K

Screen size

Either 40 or 80 characters by 25 lines

Bundled software

Spreadsheet, text editor, calendar, database, PC-communication software

Price

£999

Supplier

Poquet

Good Points Runs MSDOS.

Bad Points But only in a minimal configuration.

Conclusion Too expensive for the performance it delivers.



There have been a number of changes to the machine over the months, but like everything else about the Poquet they have been smaller than anything offered by the big boys. The price has come down, the RAM has gone up (from 512K to 640K) and the ROM has been increased (from 640K to 768K).

More importantly, the keyboard has been improved. PCW described prototype Poquet keyboards as being like a load of Scrabble letters; now the Poquet has possibly the best keyboard in this Group Test. It still isn't good, but until executives evolve matchstick fingers, the problem is insurmountable.

Display

Externally the machine is attractive. It measures 220x109x234mm when closed and will open up flat. The 70x175mm screen is surprisingly big and fills the lid well. A 640x400 display entails tiny text but you can't have everything. A 40-column mode with larger text is available, if not particularly useful in most applications.

The Poquet key also draws machine-specific functions from the F keys. F4 controls the power management, which has three different 'sleep' modes. F5 is a keyboard lock, for when you want the display on but don't actually want to do anything. Screen contrast is controlled by F6/F7. F8 disables any alarm bells set using supplied software. F9 disables the key click. It isn't much of a click but with the Mickey Mouse keyboard it is a big help.

For yuppie-toy tasks, 640K RAM is plenty. But the Poquet is designed to be used as a 'real' computer. I had a lot of

trouble finding applications which would run on so little RAM.

The only form of expansion is through the disk drives, solid state or standard. Solid-state drives come in two types and three sizes. There are battery-driven static RAM-cards bearing 512K, 1Mb or 2Mb; or Flash EPROM 1Mb, 2Mb or 4Mb which acts like ROM but can be written to using a £325 PC add-on unit. The Flash is expensive; the RAM-cards, thanks to the high cost of static RAM, are exorbitant.

The cards conform to both PCMCIA and JEIDA, two solid state disk standards. This is important. PCMCIA is becoming a popular standard, with lots of machines supporting it. This means more third parties will produce cards and prices will come down. The use of the standards opens up the peripheral markets; some fax modems will fit into a PCMCIA slot. Lotus 1-2-3 and WordPerfect are available on ROM.

Technology

The technology that makes up the Poquet was once impressive. Today, with companies like Chips & Technologies producing much faster 'single-chip' PC chipsets, it is less so — expect to see a rash of cheaper Poquet-sized machines before the year's end. The Poquet's surface-mount components, six-layer PCB and two custom chips (ASICs) are all standard stuff these days. The power management is still clever, and gets 100 hours (claimed) out of two Duracells.

Poquet supplies a special serial cable which plugs into the palmtop, and provides 25-pin and 9-pin connectors on the other end. A LapLink-like program

called PQLink provides 115,200bps file transfers. Alternatively, you can use a parallel cable. In the US, Poquet has shown a radio modem about the same size as the machine, and fitting underneath it.

The Poquet has a TSR program in ROM which provides basic calculator, WP, diary and address book functions. They are very basic. The calculator is merely four function, with no stats or financial options.

Poquet Write, billed as a note taker, is crude — but then cramming word processing features into a TSR would soon eat up enough RAM to render it unusable. There is a simple comms program, and tools to help you set up the machine, but they are all a little raw when compared with something like the Psion Series 3.

The Poquet is a machine without purpose. It would happily run dBaseII applications, but £1000 buys a machine which will cope with dBase IV if you are happy to have it on the desktop. There are no plans for a 286 version.

I can't see the Poquet having much of a future. I saw one, with enough add-ons to bring the price up to £1750, advertised in *Exchange and Mart* for £450. A fortnight later it hadn't sold. I'm not surprised.

Simon Rockman

Psion HC100

The HC fits between the Organiser 2 and the Mobile Computer (MC) in the Psion range. It comes in three variations, differing only in internal RAM

Psion HC100

Processor

3.84MHz 8086

RAM

128K to 512K depending on model

Keyboard

56 keys

Screen size

26 characters by 9 lines

Bundled software

None

Price

HC100 £395, HC120 £525

Supplier

Psion 071-262 5580

Good Points Nice modern technology.

Low cost.

Bad Points Nice modern technology takes time to learn.

Conclusion Nice machine, but examine development costs.



size: the HC100 has 128K; the HC110 has 256K; and the HC120 has 512K.

The HC100 appears, superficially at least, to be an oversized Organiser measuring 200x80x35mm and weighing 540g. There is no sliding protective case like the Organiser's but there is a hinged lid covering the memory cartridge slots in the back.

Psion offers a choice of keypads to suit different applications. The review unit had the full alphabetic version with a numeric and symbol pad underneath. The keys were calculator sized and not easy to hit cleanly. The numeric version looks like it would be much easier to operate, with much larger keys. The choice and layout of the keys is sensible, with easily accessible symbols, and separate buttons for cursor control. I would have liked to see the Shift key positioned so that the holding hand could operate it.

Screen

Buttons are provided for controlling the viewing angle of the LCD and On/Off, which are positioned near the top left of the display. To their right is a small loudspeaker.

The display itself is a dot addressable LCD with a 160x80 matrix. This would normally give 10x20 characters but the HC uses proportionally spaced fonts. The display, though tilted, is tricky to read when the machine is flat. It is perfectly clear when handheld or with the end propped up. A backlight is optional and was not fitted on the review model.

The case itself is made of tough,

accurately moulded plastic. The edges are neatly rounded and it is comfortable to hold, if a little heavy. Psion said the unit can withstand being dropped onto a concrete floor from a height of one metre, and I suspect they are right.

A 55x70x20mm NiCad battery pack, located under the rear cover, is easy to change and has an unusually high voltage (7.2v). Unfortunately, the size is such that you can't just bung in a few penlights if you find yourself with no charged-up packs. Power can also be taken from a socket in the side, and will be available from a promised interface cradle.

Packs can be recharged while installed in the machine, or the charger can be plugged directly into the pack itself.

Inside, the HC100 is a very advanced lump of computer, in spite of the CMOS Intel 8086 central processor at its heart. There are two custom gate arrays, referred to as ASIC1 and ASIC2 — no silly names for Psion's chips! ASIC1 contains a bus convertor to translate 16-bit processor transfers to the 8-bit memory bus. The same chip is used in the MC range, but strapped for 16-bit operation. It also contains a memory decoder and circuitry to provide data for driving the LCD. Other memory management functions, such as protection and I/O decoding, are also handled.

SLD bus interface

Perhaps the most interesting feature is the SLD bus interface. SLD stands for Subscriber Line Datalink, a high-speed synchronous three-wire serial interface

developed by Intel for transmitting sound digitally. This is used (via an Intel 29C48 COMBO) to accept sound from a built-in microphone or to play back samples through the speaker.

ASIC2 offers an eight-channel high-speed serial interface. Four channels are used to connect the Solid State Disks (SSDs). Two are available on the expansion connectors and one is taken to cradle-interface contacts.

The last serial channel controls ASIC3, a custom eight-channel voltage regulator, supplies power to the various subsystems when needed.

ASIC2 also contains the keyboard interface, NMI generation circuitry and the system clock.

PC connection

The HC100 has space for two 64x42x6mm SSDs in slots under the back lid. These neat 25g units contain between 128K and 2Mb of Flash EPROM, or battery-backed RAM. The same units are used in the Psion MC and Organiser Series 3. An interface allows direct connection to an IBM PC; MSDOS file formats are used, making data easily interchangeable.

Strangely, no ports of any kind are built into the HC. Instead, expansion modules are required, one being fitted into each end of the unit. The expansion bus contains a high-speed serial channel, together with a multiplexed 8-bit bus, power, a few processor signals, and the SLD interface.

Although the HC uses an 8086-compatible processor, it does not run MSDOS. It uses EPOC, Psion's own

operating system which is a lot better than MSDOS and is nice to work with. Its structure, from the applications point of view, is similar to the MAC, GEM or the Windows models. Quite why you would want a windowing front end on a handheld computer with such a small display is a good question, but the multi-tasking capabilities could be useful, allowing comms processes to take place in the background.

The EPOC used in the HC is apparently version 3 of the system used for the MC, Psion's clever but unpopular laptop range with full-sized screen and keyboard. It has a number of enhancements over version 2, which was supplied with the MC until mid 1991.

Although windowing may be a waste of time on the small display, the use of a GUI means that data can easily be presented in interesting ways by the use of fonts and graphics. If your application needs to look good, then using an HC could produce results more easily than a DOS machine.

Software development

Sadly, the clever operating system and advanced hardware are the HC's weakness too. I wasn't able to get far in programming it in the time I had it. The documentation was excellent but I was stalled by numerous 'missing links'.

Psion produces a C developer's kit that runs on an IBM PC. It consists of a standard TopSpeed C compiler and a few disks with special libraries for accessing the EPOC functions. What it does not contain is any form of user manual giving you basic information

like how to switch it on. I eventually discovered that such a document is included with an OPL (Psion's proprietary Organiser Programming Language) version of the kit.

With no obvious comms ports on the Psion I was beginning to wonder how I was actually going to shoot the compiled code from the PC to the HC. It turned out I needed something else, called an MC Link.

Alien environment

The specifications of EPOC, the quality of the documentation, and the theoretical availability of on-line debuggers, make the HC sound like a nice machine to program. However, my initial experiences suggest that this alien environment, with its incomplete developer's kit and strange ways, could have a significant penalty in development time, and therefore cost.

The technology, on the other hand, suggests that perseverance would be well rewarded. Individual units are relatively cheap, but you must consider the cost of new, non-optional extras, like SSDs and interfaces.

Frank Leonhardt

Psion Organiser LZ

Psion, a British company, was one of the first to produce a pocket computer. The early models of the Organiser, in the mid eighties, were marketed with a little success to the yuppie toy market,

but sales to OEMs were particularly significant. You have probably seen them floating around Marks and Spencer's near the tills. Psion followed this with the Organiser 2 range, consisting of the CM, XP and now the LZ. The CM and XP have 8K and 32K of RAM respectively, and 16x2 LCD displays.

The LZ and LZ64 have enhanced software and larger screens. Although they have been around for some time, the new unit (the LZ64 is simply an LZ with 64K of RAM rather than 32K) may still have a role to play in Psion's extensive portable product portfolio.

Basic design

The new models appear very similar to the old ones. The case measures 142x78x29mm and they all weigh about 250g before the installation of batteries or datapaks. They are the same basic design as a pocket calculator, with a display across the top and a square keypad below. A removable rigid plastic cover slides up the body to protect the keys and the datapaks, but strangely leaves the screen exposed. This arrangement works well, allowing the unit to be protected with the minimum of fuss. Who is going to put something back in a floppy PVC pouch after every use?

The 36-button keypad is arranged in alphabetic order with an ON button and cursor keys across the top. Numerals are accessed using Num Lock and a numeric keypad overlaid across the alphabet. Unfortunately the Num Lock and Caps Lock are accessed using a Shift key combination, which is a little inconvenient. However, the keypad is

Psion Organiser LZ

Processor

3.7MHz 6303

RAM

32K or 64K, 64K ROM

Keyboard

36 keys

Screen size

20 characters by 4 lines

Bundled software

Diary, database, text editor, calculator, world time

Price

£127.62, £161.66

Supplier

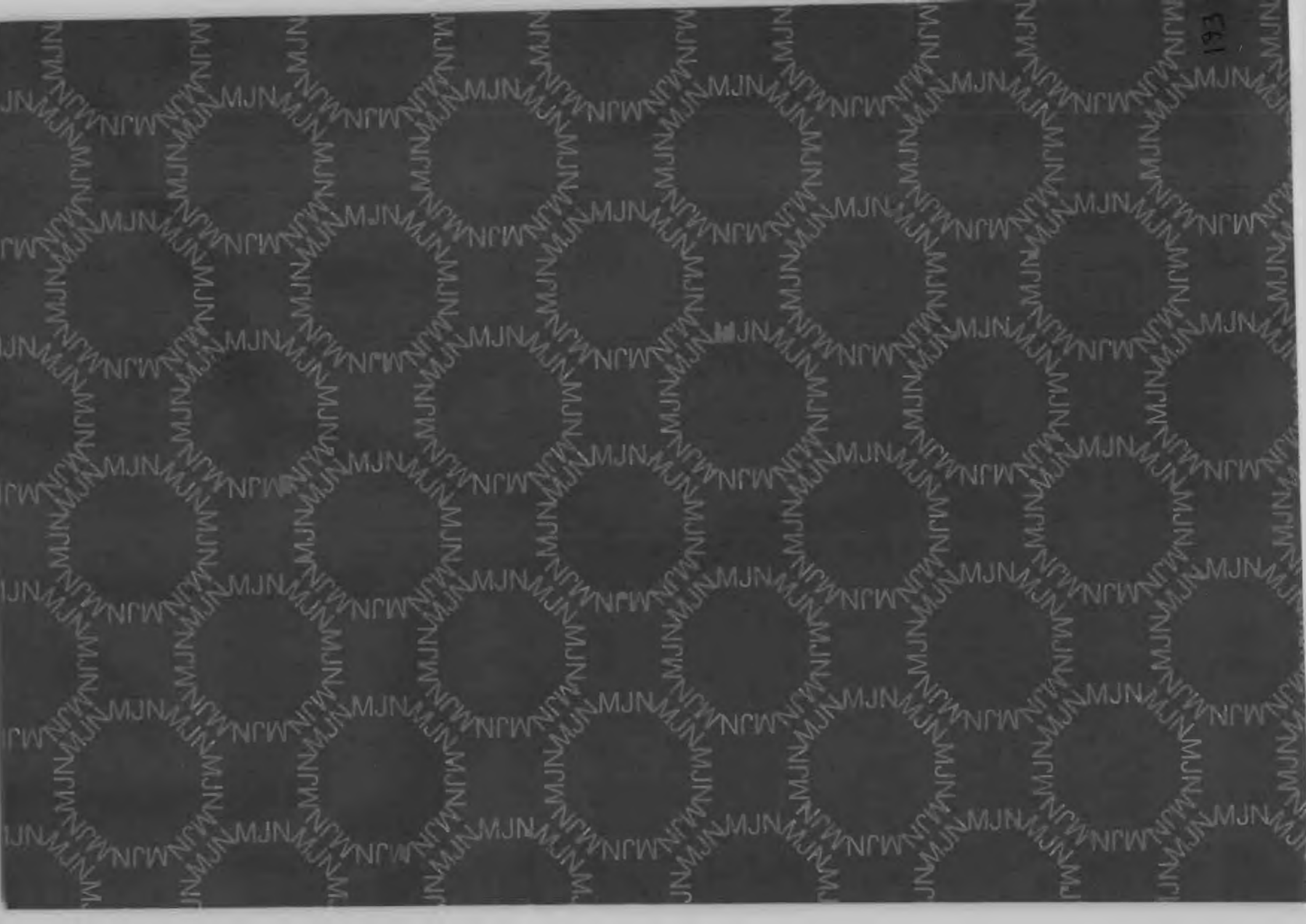
Psion 071-262 5580

Good Points Cheap, robust, proven design.

Bad Points Not programmable in C. Organiser facilities superseded.

Conclusion Low cost and size are attractive for simpler OEM applications.





about the right size for its intended purpose. Being alphabetic rather than qwerty causes considerable irritation to typists at first, but long-term users say that once you are used to it there is little point in having a conventional layout as the keys are too small for typing anyway.

The LCD screen can show 4x20 characters and is quite clear. The viewing angle can be adjusted using a thumb wheel on the side of the case. In what seems like a crazy omission, there is no light on the display, making it totally unreadable in poor lighting conditions.

The case itself is made of fairly tough plastic with a solid feel. A metal band strengthens the area around the display, though I felt that the clear plastic lens in front of the LCD was vulnerable to scratches.

Power

Power is provided by a standard 9v PP3 battery. This lasts for a few months' normal use before allowing your data to evaporate. The 90 seconds you get to change it is not always enough, as I found out to my cost, and removing the battery appears to be the only way to reactivate a 'hung' unit. This means you either need the ability to back up to a PC, via the optional serial link, or you have to save important information to a datapak.

The processor is an 8-bit CMOS 6303 running at a relatively fast 3.7MHz. The LZ can be supplied with either 32K or 64K of internal RAM, nominated as drive A. Two slots in the back of the unit take Psion's proprietary data modules, Rampaks or datapaks, via 16-pin gold-plated mini-Molex connectors.

The EPROM datapaks are available in 16K, 32K, 64K and 128K sizes and appear to the user as normal Read/Write storage devices. However, when information is deleted, the space is not reclaimed, so a datapak must eventually be erased using a UVEPROM eraser, which Psion calls a formatter.

Rampaks are available only in 32K sizes and contain CMOS RAM with a small lithium battery which maintains the data when they are removed. Psion claims data in a Rampak is safe for at least three years, after which it is a simple matter to renew the battery, having first backed up the contents.

Expansion connector

A 16-line expansion connector lies behind a sliding door on the top of the unit. Psion add-ons for this include an RS232 interface, bar-code and magnetic card readers, and a printer. However, electrical specifications and software addressing details for adding your own

hardware are conspicuously absent from the developer's documentation.

The Organiser II comes, believe it or not, with some personal organisation software. This is stored in 64K of internal ROM. On the LZ this consists of a calendar/diary, a card file, a freeform note pad, a calculator, and a utility which can tell you the time and dialling code of 400 of the world's major population centres, like Salzburg, San Francisco, and, for some unfathomable reason, Stoke-on-Trent.

In the past, I and many others have mercilessly made fun of Psion Organiser users. ('Is that a Psion Organiser in your pocket or are you just pleased to see me?'). What is the point of storing your personal details electronically when a notebook is quicker, smaller and cheaper? If you could type at a reasonable speed on an Organiser this would be a different matter, but you can't. However, having tried hard to use one for a few weeks, I am beginning to see the point — it does give you options which paper and pencil do not.

The diary, for example, allows you to enter and arrange appointments in a way which avoids double-booking and gives you an easy-to-read representation of when you are free. Setting alarms on appointments can be very useful, causing the Organiser to sound a pre-set time ahead of the actual point, and reminding you of something planned weeks in advance. I entered the times for all the good films on TV over Christmas so it would bleep to me whenever I was missing one. I still missed them all, but it was nice to know it had happened, rather than reading about it several days afterwards.

Alarms

In a separate mode, you can enter up to eight repeating alarms for particular days, daily, weekdays only, or weekly. I tried using these but was thwarted because every other one went off when it was too dark to read what it was about — no display light!

A Tidy function in the Diary will delete old entries. However, it lacks any means of prioritising long and short-term information.

The other useful facility is the card file. This allows you to enter and edit notes and store them in RAM or on datapaks. It is more useful than a book, because it will search through every word in each record: a paper version must be indexed by one word only (for example, be placed in surname order). Only when you have used such a system for a long period will you discover the true benefits — like finding the forgotten name of a company by re-

membering it is based in Bath.

Useful though these applications are, I can't see them justifying the cost of an Organiser. For some people, however, the ability to program it for their own purposes could be very useful indeed.

OPL

The Organiser is programmed using its built-in language which Psion with little imagination called Organiser Programming Language (OPL). 'Oh no,' you cry, 'not another proprietary language to learn!'

Relax: OPL is basically BASIC with a new, shorter, and less user-friendly acronym. There are a number of sensible enhancements, such as DO..UNTIL loops, WHILE loops, BREAK and CONTINUE. There are also some daft looking omissions such as FOR..NEXT loops, and a SWITCH or ON..GOTO statement. This, and the absence of line numbers, makes OPL different enough from BASIC to make porting difficult.

OPL is procedure-based with both local and global variables. The procedures are modelled more on C functions than BBC BASIC PROCs, as they all have return values. A function which returns the address of a variable, together with PEEK and POKE, allow safe variable de-referencing, and all GOTOs point to labels. You can also use machine-code subroutines if you want to get your hands dirty.

File handling is particularly good, with a neat, clean method of performing record-based random access. There is also a wide variety of time/date functions, statistical and mathematical functions, and even a statement for turning off the power!

Penalty

OPL looks nice but it is not C, nor any other mainstream language, and as such there is bound to be a considerable cost/time penalty in developing for it. A PC-based development system is available but I would try to avoid it for any major project unless the low-cost hardware itself had features which made it worthwhile. The machine's organiser functions have now been superseded by Psion's Series 3.

Frank Leonhardt

Psion Series 3



The Series 3 is Psion's latest attempt to create a mass-market handheld computer, and it should be the

most successful. The Series 3 looks attractive, is small and light enough to fit comfortably into a trouser pocket (165x 85x22mm, weighing 240g plus batteries), but it has built in to it an 8x40 character screen and a qwerty keyboard. More importantly, it has an excellent set of built-in applications and a storage capacity which is large and inexpensive in comparison with most other machines of its size.

PC power

As with many of the palmtops on the market today, the Series 3 uses an 80C86-compatible NEC V30H processor running at 3.84MHz. For the moment at least, machines this size are about as powerful as the original PC. On the size of files these machines typically use, the slow speed is usually not noticeable, and of course a lot of the things that require powerful processors — large, colour, high-resolution graphics for example — are not provided in a pocket PC. A database of 564 names, addresses and phone numbers can be searched in a maximum of 5.5 seconds, which is bearable.

The reasons it uses such a comparatively feeble processor are its low cost, but probably more importantly its low power consumption. The Series 3 uses two AA batteries (with a Lithium watch-type backup), yet it lasts a claimed 120 hours. In four months of daily use, I have had to change the batteries only twice.

Storage capacity is tiny and expensive compared to desktop PCs. While

battery-backed RAM-cards are available, Psion is keen to promote its Flash RAM-cards. While you can configure the Series 3 to have up to two 2Mb Flash cards (projected to reach 8Mb by the end of 1992), it would cost an extra £299.28 for each card. If your documents are relatively small, and you download to a PC so that you use only short-term storage on the Psion, you can get away with a £102.08 512K Flash memory card.

Flash memory is cheaper than conventional memory cards, and is also less vulnerable to damage and erasure. The 60x40mm, 25g cards draw power only when being read or written to, and are solid state — in theory, they can be left outside the machine almost indefinitely without data loss. Unfortunately, when you erase files on flash disks you do not actually free up space until you format them. As a result, the cards gradually fill up until you copy all your files off them and clear them.

Non-standard cards

Also, unfortunately, Psion's cards do not conform to the increasingly popular PCMCIA standard. At the moment, in this relatively undeveloped market, this is not much of a problem, but it could mean the machine won't benefit from some of the new products (like card-sized modems) that will emerge for the palmtop and laptop market.

The screen is not backlit (no palmtops are, because of power limitations), but it is clear, uses attractive proportional fonts, has good adjustable contrast, and

can be used under most normal lighting conditions. The keyboard is disappointing, which you would expect to some extent, considering the size and price constraints.

The keys are small, of course, and they occasionally don't register, which means you spend longer than usual correcting typos. The layout is OK, except for the strange decision to put a single quote as a Psion-key character rather than a shifted one. There is no provision for a numeric keypad over the regular keyboard. I manage around 22wpm by the time I've corrected typos — less than half my rate on a conventional keyboard.

Applications

The main applications provided are a word processor, a database and an appointment diary/to-do list. A Lotus-compatible spreadsheet sold for the Series 3's big brother, the MC400, will not be available on this unit until at least March (and Psion has been pretty lax on keeping to delivery deadlines in the past). It will cost £69 (or less), and will take up one of the two available card slots unless you copy its contents onto another, larger Flash disk.

All the applications are memory-resident and can be called up simply by pressing touch-sensitive icons above the keyboard. Primitive help files are available if you press the Help button, and they can be controlled either using command keys or pull-down menus (which show up when you press the Menu button).

Psion Series 3

Processor

NEC V30H (80C86 compatible, 3.84MHz)

RAM

128K or 256K

Keyboard

58 keys + eight touch-sensitive task selection pads

Screen size

8 lines by 40 characters

Bundled software

Calendar, word processor, database, calculator, world clock, OPL programming language

Price

£170 for the 128K machine or £212.72 for the 256K

Supplier

Psion 071-262 5580

Good Points Excellent software. Good programmability. Good screen.

Bad Points Naff PC (or Mac) link.

Conclusion Probably the state of the art, unless you really need DOS.



The word processor can read RTF file format, which means you can swap files with Word and other major WP products. Unlike the standard built-in text editors that come with other palmtops, this one is capable of formatting text, aligning it, and setting font sizes: styles can even be applied. In fact, this can do most of the same text manipulation that a conventional word processor like Word can do. It can even show text as underlined, italic or bold, and it can define several levels of outlining (though you can't manipulate views of your text in an 'outline mode').

Calendar

The Calendar/To-do list program is much better. In fact, after four years of development, it does pretty nearly anything you would want it to — except run on your own PC. Of course, you can search for the text of events and you can give events durations (seeing at a glance if two or more overlap) and set alarms for them, either for the time itself or in advance by any amount. You can also make events repeat at any interval, including only workdays (you can even make your workdays differ from Monday to Friday).

If you have ever tried using a computerised diary system and given up in frustration, this is the system that will change your mind about them. In the same module, Psion also includes a To-do List function which allows you to enter reminders of up to 60 characters, then give them priorities between 1 and 9; not terribly sophisticated, but easy to use and accessible.

The built-in database doesn't do much, but what it does, it does well. It can't be sorted or search and replaced, you can't move through it record by record, and you can't do Boolean searches of it. But it does look for text strings quite quickly, and it has a good import/export function for communicating with desktop computers.

Auto-dial function

It will most frequently be used to store phone numbers, and you can set it up to auto-dial through the speaker on the back. But because this involves putting in special codes, this feature isn't much use if the data is shared with a desktop database. If you don't mind that limitation, however, the auto-dial function can be very powerful: for example, the World function can be interrogated to ensure that you always use the right dialling prefix, whichever country you are in.

The Agenda, Word (processor) and Data (base) modules are likely to be the most often-used built-in programs,

but World is the program most likely to be flashed at friends. It shows a world map with the cursor located at the currently-selected city. Not only does it tell you the time and international dialling code for more than 400 cities in 150 countries, it also tells you the distance between any of them and your 'home' city and the local time of sunrise and sunset for that day.

You can even add your own cities, provided you can find their longitude and latitude. It is a classic piece of 'chrome' — a fascinating but largely irrelevant feature — but no less charming for that. For some strange reason, there is an entirely separate function called 'Time' where you set the time and date and any alarms you don't wish to set using the diary. And there is the inevitable calculator, which has ten memories, several scientific functions, keeps track of up to 10 past commands and can even work in hexadecimal.

Best of all, the calculator is programmable, as indeed is the whole machine, using Psion's BASIC-like Organiser Programming Language) or C. Kits for developing the code on a PC are available (see the LZ review here).

Weak link

The weak link to all of this is the PC (or Mac) Link. When the MC400 was launched more than two years ago, it had a PC-sized screen and a graphical user interface with a touchpad while PCs were still largely stuck with DOS. Presumably for that reason, the PC was made the slave while the MC400 controlled file transfer. Unfortunately, the Series 3 also works this way. As a result, you are stuck with the rather difficult-to-use filing system and small screen of the Series 3 when you want to transfer files.

It is easy enough to send the whole contents of a Series 3 across to a PC for backup, say, but if you want to be selective in the files you want it can be annoying — especially if you want to copy to a directory a few levels down. Reading the directory information across takes a long time especially if you are working on a Macintosh.

Stripes

One final warning: there may be a design problem with the screen, probably caused by the hinge between the screen and the keyboard on the Series 3. After two months' happy use, I found my machine's screen was starting to develop 'stripes'. I wasn't too surprised, as it was one of the first production models. I swapped it for a new one, and was promised that the problem had been solved. A few days ago, the first

'stripe' showed up on my new machine's screen, but I haven't seen them since and I'm hoping it was a fluke.

Is the Series 3 the last word in handheld computing — 'perhaps the Sony Walkman of computers', as Psion chairman Dr David Potter would have it? Probably not — a whole pile of companies is working away trying to come up with the definitive handheld device. But for the next few months at least, I believe the Series 3 is king.

David Brake

Sharp IQ-8200

Handheld organisers come and go, but the Sharp IQ has stuck around for a few years. It's not one of the smallest pocket organisers on the market, but as long as it fits into your pocket, size doesn't really matter.

The IQ-8200 is long and thin, approximately the same size and shape as a large TV remote control. On the outside of the case there are a few well hidden sockets. These are for connecting to a remote computer, printer, cassette tape recorder, modem or another Sharp IQ. There is also a socket for a DC power supply, and on the top is what looks like a volume control, but is actually the eject lever for IC (Integrated Circuit) cards.

Remarkable keyboard

Opening the lid reveals a qwerty keyboard. Gone are the days of the Psion Organiser-style A-Z keyboards, which were virtually unusable. The Sharp IQ keyboard is quite remarkable: you can actually type on it at a reasonable speed; there is a big enough gap between the keys for you not to press two or three at a time. Touch-typists can forget it though: although the keyboard looks normal enough, the letters are slightly out of place, so if you don't look at the keys you end up with a page of garbage (I can't touch-type but my mother can, and I got her to test it.)

There are 80 keys, which is enough for each key to have no more than two functions, unlike some organisers that have up to four on the same key. The shift functions of the numbers are the same as those on a PC, and above the numbers are the normal calculator keys.

The top two rows contain the 12 keys that Sharp refers to as the 'Command Center'. These are for choosing which of the built-in functions you wish to use. The built-in functions are mainly for storing appointments, addresses and telephone numbers. The other functions are a calculator, a world clock, a notepad and an outliner that

Sharp IQ-8200

Processor

Sharp proprietary

RAM

128K RAM

Keyboard

80 keys (plus 20 per added card)

Screen size

4 lines by 30 characters or 8 lines by 40 characters

Bundled software

Calendar, text editor, database, calculator, world clock

Price

£221.27 inc VAT

Supplier

Sharp (0800) 262958

Good Points Usable qwerty keyboard.

Bad Points Expensive.

Conclusion A powerful, easy-to-use executive toy.



produces bulleted lists and has quite a complex indexing and search system.

The last key is for activating whatever IC card is inserted. The standard model comes with what looks like a help card to guide you round the organiser, but it turns out to have no function other than to protect the touch-pad; the help feature is programmed into the IQ. The review model was supplied with a scientific computer card, which as well as supporting scientific calculations, allows BASIC programming.

RAM-cards

The IC cards are the same shape and size as credit cards, and simply slot in at the rear of the case. Once inserted, a card's functions are visible through a clear plastic touchpad which is adjacent to the screen. A wide variety of IC cards is available, including RAM-cards which can be used to expand the IQ's memory above 128K.

The 87x49mm screen normally displays eight lines of 40 characters but can be switched to four lines of 30 characters. The display isn't backlit, so you have to strain your eyes a bit under poor lighting, and you can't use it in the dark (but I can't think of many instances when you would want to). The screen/lid can be set in two positions, flat and 45°, making it easier to use standing up.

The start-up display can be changed from the calendar to a title page giving the owner's name, the date, the time and a prompt for a password. The manual explains what to do if you forget your password, and how to go

about changing it. This doesn't mean that anyone with a Sharp IQ manual can access all your secret data though, because part of the procedure is to delete all the items marked secret. My organiser spontaneously developed a password which only itself knew and wouldn't allow me to get at my data.

Once I had sorted out my little password problem (I reset the memory) I began to use the IQ on a day-to-day basis, and to my surprise found it to be quite usable — possibly even useful. I'm a reasonably forgetful person, but writing notes in the IQ seemed to help, mainly because I don't lose them like notes written on pieces of scrap paper.

Closely-linked functions

Four closely linked 'command centre' functions are Calendar, Weekly, Daily and Schedule. A day several months ahead can be highlighted on the calendar and then switched to any of the other three functions to enter appointments and alarms.

Setting an alarm couldn't be easier: once an appointment or event has been entered on a particular day, pressing the alarm button sets the beeper to sound at the correct time.

Although the alarm is easy to use, it isn't very useful. It isn't loud enough to be audible unless there is complete silence — the noise of a few PCs in an office is enough to drown the sound.

The telephone directory can be split into three sections and each can be given a different name. An entry in the directory consists of three fields, Name, Number and Address. There are also

five user-definable fields, which unlike the other three are visible even when empty. Searching through entries can be done in three ways: by searching through them all sequentially, by selecting the first letter (or few letters), or by searching for the occurrence of a particular word in any field.

The Business Card feature works in the same way as the Telephone Directory. There are fields for Company, Department, Main Tel Number, Fax Number, Dept. Address, Name, Position and Ext/Direct, plus five free fields that can be defined. There are some strange limitations on the number of characters in certain fields. The company name can be up to 40 characters, the department name, main and fax numbers and address can be up to 512 characters, and the personal name, position and extension/direct number can use up to 1536 characters (maybe this is in case you have any foreign contacts, with long names and ridiculously long phone numbers).

The Memo function is a simple word-processor, for storing pieces of information that are not appropriate for the other functions. If Memo entries include figures, such as prices and estimates, they can be used directly in any calculations. Entries are stored and retrieved in the order in which they were entered, but the order can be swapped around if you want to access certain memos quickly.

The calculator function behaves like a normal 10-digit calculator, with constant, percent, square root and memory features. It can also be used as a paperless

printer, which retains the calculation sequence you enter and allows you to display it for modification. This is very useful for carrying out a long series of calculations on a set of values, as you only have to change the initial value and the answer will be recalculated automatically.

The IQ can store just under 2000 appointments, more than 2500 telephone directory entries, and more than 800 memo entries — the exact number, of course, depending on the size of the entries. With continuous use, the battery life is between 100 and 150 hours and the memory backup battery life is approximately five years.

One of the best

I will be sorry to give the Sharp IQ back. I'm not sure whether I would actually buy one. If it was a choice between parting with over £250 or using my old Filofax, I think the money would stay safe and sound under my mattress. If you have decided to buy an electronic organiser though, I would recommend you look at the Sharp IQ: it may not be the cheapest, but it has to be one of the best around.

Mat Beard

Sharp PC-3000



Sharp Electronics Corporation markets electronic gizmos from calculators upwards.

Business products include PCs, laser printers, scanners, faxes, copiers and EPOS (electronic point of sale) equipment while TVs, VCRs, microwaves and stereos are sold into the domestic market. Sharp is particularly strong in the LCD area, with its screens (mono and colour) appearing rebadged on many manufacturers' products.

Unopened, the PC-3000, in pearlescent dark-grey plastic, looks like an instrument case containing some expensive tool, which I suppose is exactly what it is. Though sold as a 'palmtop', at 9x4.5x1in the machine is too bulky to hold in one hand while typing with the other. It really needs to sit on your knees (a kneetop?) or desk when in use. My kitchen scales registered the machine at 1.5 lbs; Sharp says it is 'just' over a pound. I would find it light enough to carry to work every day, something I would not do with any PC notebook I've ever tried.

The front edge contains the case lid release button and the eject and lock sliders for the two PCMCIA-standard memory cards. The right-hand side houses the PCMCIA 'Drive A' socket, containing a 512K memory card on the test model. This is labelled SRAM, but contains its own lithium battery power source. The cards are like a thick credit card with a 68-pin socket along the short edge.

Also on the right edge of PC-3000 case is a dinky 5/8in parallel port with hinged cover. The PC 3000 comes with two 9in cable extensions which allow connection of standard PC 25-pin par-

allel and 9-pin serial interfaces. The even dinkier 3/8in serial port is on left hand side along with the 'Drive B' socket.

Made in Hong Kong

The rear of the machine houses a 2in 40-pin expansion bus which takes the optional battery powered 3.5in floppy drive. Alongside is the DC power input socket and a screw-fastened cover for the three AA main batteries. On the base are four good quality rubber feet, a well protected reset button, and access to the lithium 'backup' battery as well as a 'Made in Hong Kong' sticker.

A front pushbutton releases the hinged lid-screen, which can be positioned securely at any angle — essential for LCDs, being so sensitive to viewing angle. Sharp has wasted little space in this design. The 77-key qwerty keyboard completely fills the base 'half' of the machine and the mono LCD screen almost fills the upright 'half'.

Coming from a desktop PC I found this smaller keyboard unconfusing and usable. This is the first sub-notebook I've used with a reasonable keyboard. The large and clear supertwist display has a 640x200 resolution, four greyscales, and displays 25 lines of 80 characters. It apparently supports both CGA and MDA. I liked the size of the display a lot and the 8x8 characters were well defined. Contrast was easily controlled using function keys but the cursor was a little ill defined at times and the screen refresh rate could have been faster.

Sharp PC-3000

Processor

10 MHz 80C88A

RAM 1Mb of RAM 1Mb RAM, 1Mb ROM,

Keyboard

77 keys

Screen size

80 characters by 25 lines

Bundled software

Diary, text editor, spreadsheet, calculator, database, PC link

Price

£680.00

Supplier

Sharp 061-205 2333

Good Points Good screen and keyboard plus friendly built-in applications.

Bad Points Expensive, bulky compared to other organisers.

Conclusion Nice but pricey.



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Due to constant advances in technology, specifications and prices are subject to change without prior notice.

Internally the PC-3000 has an 8-bit 10MHz 80C88A processor with a DIP BIOS. 1Mb of ROM contains DOS 3.3 and Sharp's own integrated PIM software (Personal Integrated Management, if that really makes things any clearer) and some utilities including Traveling Software's LapLink. An additional 1Mb of RAM is also included, part of which is partitioned up into RAM-disks.

Right first time

I found this machine very easy to use. It doesn't usually happen when testing computers but with the PC-3000 everything I tried to do happened first time: I didn't need the manual. Most aspects were configurable, not quite like your desktop PC but not bad for such a midget.

The built-in PIM software provides Address Book, Scheduler, Editor (for word processing), Worksheet (for spreadsheet work), Calculator, Clock, To-do List and File Manager functions.

The File Manager displays the 'disk' space 'window' and the directory contents window simultaneously — a good feature — and all the usual file handling functions are there. This is not exactly Windows 3.0 but it works well.

The worksheet function was another pleasant surprise. Presented with a standard row and column empty screen, I just typed in a column of numbers followed by the Lotus 1-2-3 '@SUM' command (including highlighting the range with the cursor) and it all worked. I was impressed.

I was even more impressed when I plugged my printer into the PC-3000 parallel port. Again, with no preamble

— configuring printer drivers or anything else — the Sharp calmly printed off the spreadsheet. I was now keen to test the built-in LapLink software by downloading some other DOS applications (otherwise known as games). The LapLink implementation was as friendly as the other software but — damn it — I didn't have the right serial cables, so end of test.

The F10 'pop-up' key takes you straight from anywhere to the 'pop-up' PIM menu where you could choose another application. Each application, when running, would display its own F key 'map' as a menu bar along the bottom of the screen. Pressing the appropriate F key produces its own pop-up menu window. All this on-screen prompting was a great bonus for one coming from the OWRM (Only Wimps Read Manuals) School of Computing. But the manual is well-produced and clearly laid out.

However, I did have a few problems. I occasionally got an 'Abnormal Program Termination (0008,0000)' message, which though self explanatory, was not very helpful. A minor bug caused the worksheet cursor to disappear during copying. More worrying was the power (or rather battery) consumption. During some (admittedly heavy) spreadsheet calculations, a 'Replace main batteries' message would appear momentarily, and this only four hours after being assured that the batteries were reasonably new.

No contest

Against its obvious competitor, the Poqet PC, the Sharp PC-3000 has a

better keyboard, a better display, more memory, more interfaces, superior software, and at today's prices is cheaper. No contest.

This is a nice machine but should it be compared with other IBM PC compatible notebooks or against other organisers? It is smaller and lighter than a notebook but lacks the features, power and hard disk. Against most other organisers it is much more functional, DOS compatible, easy to use and has better display and keyboard, but on the other hand is relatively bulky and expensive. In my view it is neither a PC nor an organiser, while quite successfully being both.

Nick Edmunds

Texas Instruments PS6600

Frankly, I'm amazed that this machine has just been launched — it looks like something people might have struggled with in the mid eighties. The more I looked at it, the less I liked it.

The keyboard is qwerty-standard, but a raised lip behind the space bar prevents using your thumb to hit it properly. For some reason, while there is a semicolon key, you can't get a comma without hitting Shift first. There is only one Shift key and it doesn't work with letters: yes, EVERYTHING YOUTYPEISINUPPERCASE, WHICH MAKES ME FEEL AS IF IT IS SHOUTING AT ME ALL THE TIME.

The PS6600 also shows carriage returns on screen, which is a pretty naff

Computing in your pocket

If you want to run familiar DOS applications, but use a machine that fits in a pocket (well, a pretty deep pocket) then the **Sharp PC-3000** is the no-compromise solution. If you just want an organiser with DOS-compatibility to write and run small programs of your own, the **Pocket PC/Portfolio** is a fraction of the price if you buy it in a cardboard box from Atari, but don't expect it to run off-the-shelf packages in its 128K RAM!

The **HP 95LX** you could view as a 'grown-up' version of the Pocket PC. With a more serious amount of RAM and better applications, including a nearly-complete version of 1-2-3 v2.2, it would make a good compromise solution for half the price of the PC-3000.

As for the **Poqet**, we thought it was overpriced for what it could do when we reviewed it in 1989, and we aren't very impressed now, especially given

what the PC-3000 can do for less.

The four test machines which were designed for heavy customisation for niche applications, could each be useful in different situations. Of the DOS machines, the **Husky** would be the only choice if you wanted to work in dangerous environments (or with clumsy staff). The **GRiD**, which is a good deal cheaper, would be the best bet if you had a smaller company because the familiarity of the DOS environment would keep development costs down. If you have a larger organisation, though, the technological and price advantages of **Psion's Organisers** might be worth the higher development costs — whether you use the HC100 or the LZ would depend on how complex your requirements are.

But all most of us want is a good, relatively inexpensive pocket organiser that can communicate with a PC

(or maybe a Mac). Casio and Sharp both have a range of inexpensive units with fairly primitive but effective organisation functions. Because they have been around for a while, the more expensive ones like the **Casio SF-9500** and the **Sharp IQ-8200** have developed a variety of useful (and a few rather bizarre) add-on cards.

The **Canon Wordtank** is really good at being a dictionary but lousy at being an organiser. The **TI PS6600**, despite being a brand new machine, is almost useless for any function. The **Agenda** deserves a look: many of us here in the PCW office know people who swear by them, and if you can master microwriting it is the only machine to offer that unique advantage. But if you are looking for a good, all-round personal organiser with few quirks, the **Psion Series 3** (winner of PCW's 1991 Best Gadget award) is still the one to beat.

Texas Instruments PS6600

Processor

TI proprietary

RAM

64K

Keyboard

65 keys

Screen size

32 characters by 6 lines

Bundled software

Diary, database, world time, calculator, text editor

Price

£93.62

Supplier

Texas Instruments (0234) 270111

Good Points Might be sold off cheap.

Bad Points It's hard to choose!

Conclusion Adequate as a paperweight.



touch. The keys which switch between 'modes' are tiny and squeezed up at the top of the unit, but there is a large set of cursor keys on the right-hand side, plus a 'search up' and 'search down' button. Editing text is a hassle because there is no backspace key — make an error, and you have to cursor back, then delete.

Screen shock

The screen was an even bigger shock — it displays 6x32 characters, each made up of a 5x5 dot matrix. Make the contrast of the screen dark enough to see the text properly, and the squares that define each character start to show through — ugly and hard to see. The only redeeming feature is that the screen can be set at an angle to the keyboard (some cheap organisers open out flat so that you have the greatest difficulty typing and seeing the screen at the same time).

The built-in software is not user-friendly. For example: if you search for a telephone number, the machine will by default search only the first characters; in other words, if you want to find 'DAVID BRAKE', you have to type in 'DAV' — it won't find 'BRAKE'. If you want to find a string that could be anywhere in a record, you have to prefix it with '/' — very intuitive.

Consistently clumsy

The PS6600 is, however, consistent in its clumsiness. Once you have learned to use the phone book, you can use the memo function. In fact, they are almost identical: you can put up to 252 charac-

ters in a phone book record and as much as 254 characters in a memo entry, but otherwise they work exactly the same. You don't have 'files' in the PS6600, though you could simulate them by typing a filename as the first line of your memos since that is what you would find by default in a search.

The scheduler is pretty futile. What is the point of working digitally if you cannot, for example, make an appointment repeat? That's right — you have to type in birthdays manually, every year. There is no clipboard, so you can't cut and paste the information, either. And while you can put in a duration for an event, it won't stop you (or even warn you) if you try to put two things in an overlapping time period.

The closest it comes to a repeat function is that you can put in one or more daily alarms (using a separate function, and without including any message to tell you what they mean). It has a separate button for a Calendar function, synchronised with the scheduler, but all this does is put a dot in the top right of a date if you have something on in the morning or a dot in the bottom right if you have something on in the afternoon. If you aren't dissatisfied enough already, let me point out that, as far as I can tell, there is no way to schedule anything without setting an alarm.

It has a calculator which, in addition to standard arithmetic, does square roots and 40 different measurement conversion functions (including one to translate feet to inches!

If you want to keep your data secret,

you can protect it all with a password — it will be so secret that you won't even get your alarm reminders. If you forget what it is, you will have to reset the machine, erasing all the data in it.

The final peculiarity is the way the memory works — though you can erase things, the space is not freed up right away. Instead, you have to remember from time to time to 'rearrange memory space' (which you have to do three times — once each for the Telephone, Scheduler and Memo functions).

While there are no expansion options at all, you will be able to connect the PS6600 to your PC, using an optional cable which will be available in May.

One to avoid

The best I can say about Texas Instruments' PS6600 is that it can do many of the things you would buy a digital organiser for: it has a qwerty keyboard, and the screen can be angled for proper viewing. Unfortunately, the software is about as clumsy as can be imagined, and it is terribly limited in many other ways.

Fortunately, you can buy a Casio SF7500 for less money which, while still clumsy is rather better, or spend an extra few quid for one of the more powerful, expandable and friendly 'grown-up' organisers. Believe me, the extra investment is worth it: an organiser that is a pain to use will be gathering dust at the bottom of a drawer within weeks of purchase.

David Brake

POCKET PCS

	Processor	RAM	Storage Options	Expansion Options	Keyboard	Screen Size	Weight	Bundled Software	Database	Diary	Text Editor	Calculator	Spreadsheet	World Time	Other	Price	Supplier
Canon WordTank	Canon Proprietary	32K RAM, 1.5M ROM	None	C38.25 per dictionary (French, German, Spanish, Italian, ten-language phrasebook)	67 key, QWERTY	20 characters X 7 lines	285g		Y	Y	Y				English language dictionary	£152.34	Canon 081 773 3173
Casio SF-7500	Casio Proprietary	64K	None	PC Interface £79.06	81 Keys, QWERTY	32 characters X 6 lines	147g		Y	Y	Y	Y		Y		£65.10	Casio 081 450 9131
Casio SF-9500	Casio Proprietary	64K	64K-256K cards	Spreadsheet, spelling checker, Translator, Scientific calculator, PC link	80 key, QWERTY	32 characters X 6 lines	255g		Y	Y	Y	Y		Y		£148.94	Casio 081 450 9131
DIP Pocket PC Professional/Atari Portfolio	8MHz 80C88	256K ROM, 128Kb RAM	64K-2Mb RAM cards	Parallel link to PC (bundled with Professional)	63 key, QWERTY	40 characters X 8 lines	453g		Y	Y	Y	Y	Y		Pocket PC Professional has 128K RAM card, compatible PC versions of software, utilities, brickcase	£399 or £170.17 from Atari	DIP 0483 301555/ Atari 0753 533344
GRD N88	4.96MHz 8088	640K	Two slots - 128Kb or 256K cards	Cradle available to connect to PC	50 keys	20 characters X 15 lines	545g								PC communication software	£999	Victor 081 887 6585
HP 48SX	HP Saturn (proprietary 4-bit)	30K	Two slots - 256Kb RAM each	PC link, IR printer link, periodic table, engineering and other third party cards	53 keys	22 characters by 8 lines	300g								over 2,100 calculator functions	£287	Hewlett Packard 0344 360000
HP 95LX	NEC V20H (8088 work-alike)	1Mb ROM, 512Kb RAM	Single PCMCIA 1.0 slot (up to 2Mb)	PC, Mac and Windows link Dictionary/Thesaurus Translator Specialist maths	80 keys, QWERTY	40 characters X 16 lines	311g		Y	Y	Y	Y	Y		Spreadsheet is 1-2-3 2.2 (missing a few bits), calculator is HP 1982 financial	£449	Hewlett Packard 0344 360000
Husky FS2	8MHz 8086	128K of flash EPROM, 1Mb of RAM	Up to 4M internally	Cradle link to PCs or RS232 ports	56 keys	40 characters X 8 lines	750g (with batteries)								PC communication software	£1,449 (£1,249 for 512Kb)	Husky 0803 668181
Microwriter Agenda	4 MHz Hitachi 6303	32K or 64Kb (128K soon)	Cards 32-128K	Connects to PC, Macs, Spreadsheet, Finance and Math, Utilities, English to French or German or Spanish, Basic Compiler, Fax Modem	5 Micro-writing keys, 58 function & A-Z keys	19 characters X 4 Lines	275g		Y	Y	Y	Y				£148 (for £199 for 64K version)	Microwriter Systems plc 071 493 8111
Poquet	7 MHz 80C88	640K	Floppy disk, RAM cards, Flash RAM cards		76 Keys, QWERTY	40 or 80 characters X 25 lines	540g		Y	Y	Y		Y		PC communication software	£999	Poquet 0895 430001
Pison HC100	3.84MHz 8086	128K-512K	Two slots for RAM, Flash RAM or Program cards	Cradle, bar code reader, magnetic card reader, modems	56 keys	26 characters by 9 lines	540g									£395 to £325 depending on RAM	Pison 071 262 5580
Pison Organiser LZ	3.7MHz 6303	64K ROM, 32K or 64K RAM	32K RAM or 16Kb-128K EPROM or 256K flash	11 Pison-made packs, plus numerous others from third parties	36 keys	20 characters X 4 lines	210g		Y	Y	Y	Y		Y	programming language	£127.62 (32Kb RAM) or £161.66 (64Kb)	Pison 071 262 5580
Pison Series 3	3.84MHz NEC V30H 80C88 compatible	128K or 256K	Two slots for RAM, Flash RAM or Program cards	PC or Mac link, external modem, spreadsheet	58 keys (QWERTY) + 8 touch-sensitive pads	40 characters X 8 lines	240g		Y	Y	Y	Y	Y	Y	programming language	£170 (128Kb) or £212 (256Kb)	Pison 071 262 5580
Sharp IQ-8200	Sharp proprietary	128K RAM	One slot for 32Kb-128K RAM cards or Program cards	Spreadsheet, Expense manager, thesaurus, 8-language translator, English to French or German dictionaries, Scientific Calculator, four games, Wine Guide...	80 Keys (QWERTY) plus 20 per add-on card	30 characters X 4 lines or 40 characters X 8 lines	283g		Y	Y	Y	Y		Y		£188	Sharp 0800 262958
Sharp PC-3000	10MHz 80C88A	1Mb RAM, 1Mb ROM	External floppy, 512Kb IC cards	Laplink included	65 keys (QWERTY)	32 characters X 8 lines	280g		Y	Y	Y	Y	Y			£680	Sharp 0800 262958
TI PS6600	TI Proprietary	64K	none	PC Link	65 Keys (QWERTY)	32 characters X 6 lines	280g		Y	Y	Y	Y		Y		£93.62	Texas Instruments 0234 270111

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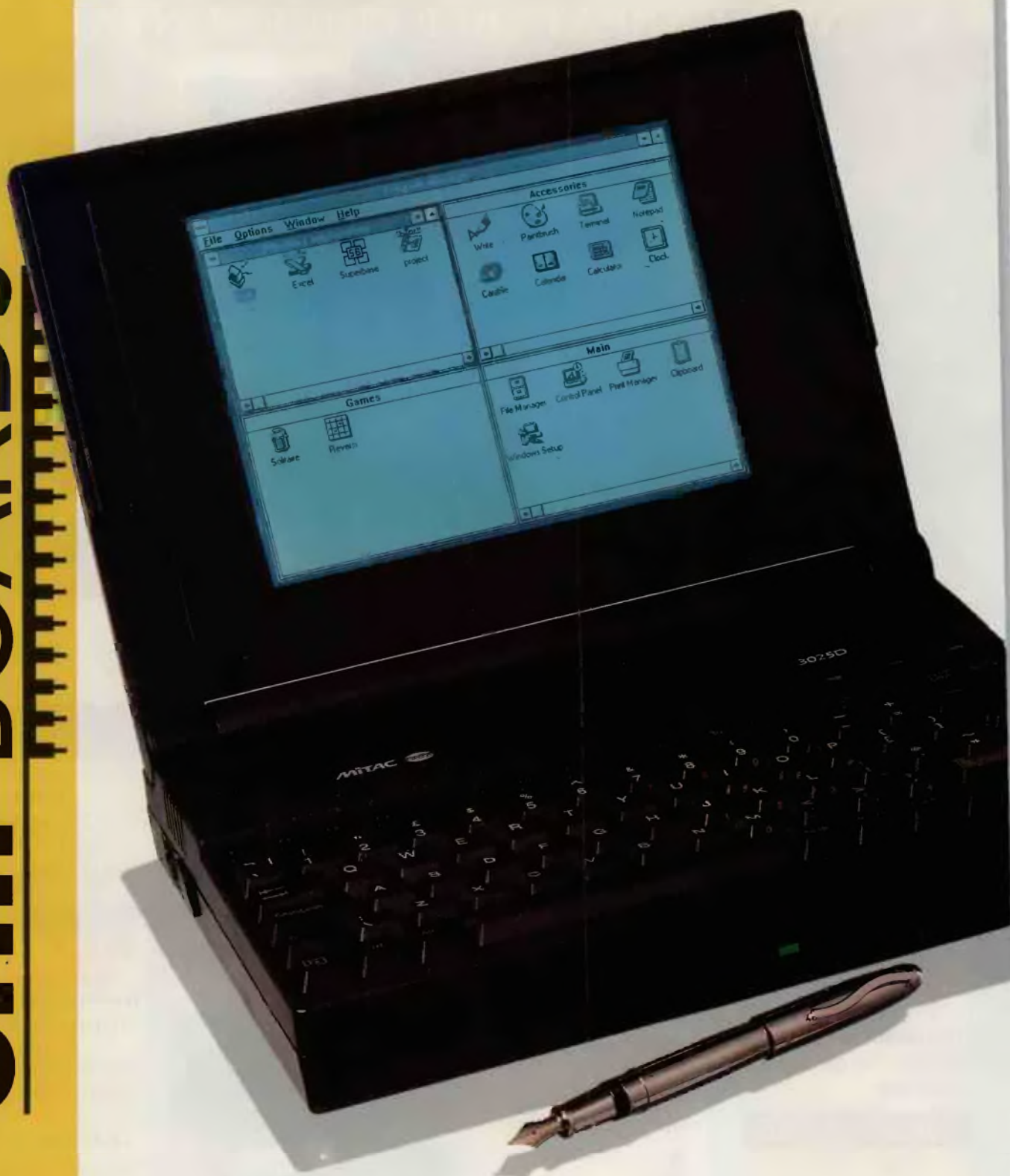
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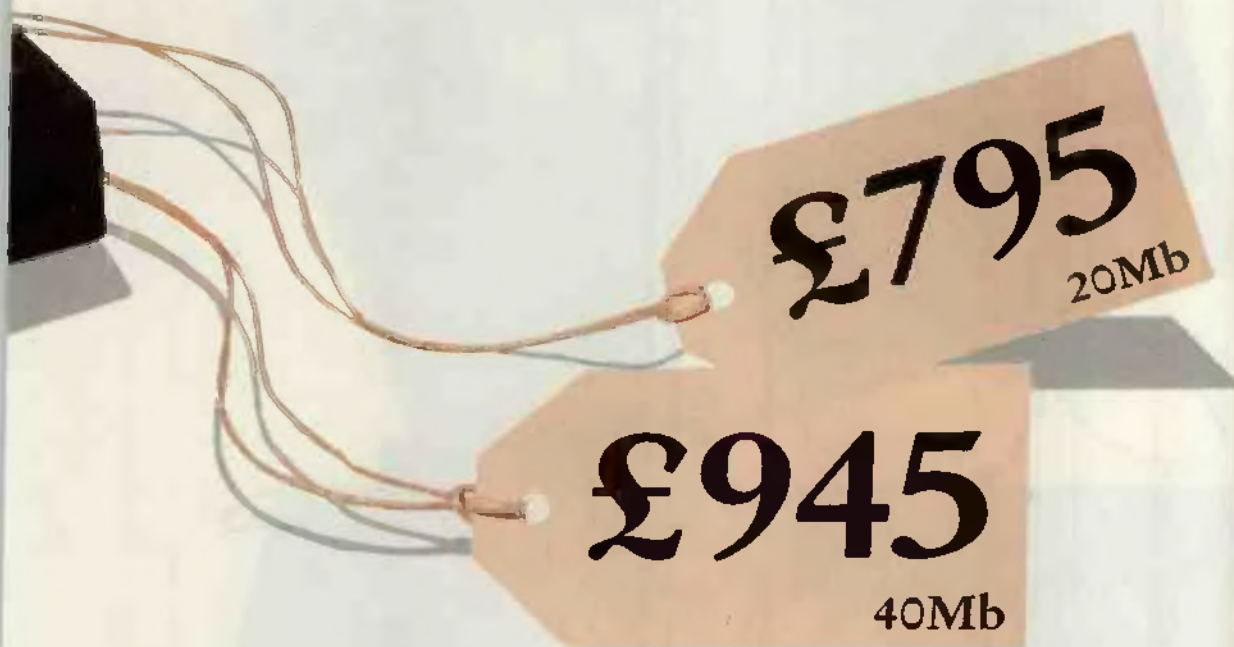
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Momenta

Investors put \$40 million into this 'anytime, anywhere' pen-based machine, brainchild of Atari ST designer Shiraz Sivji. It uses a thirsty old SX, an unlit mono screen, a tacky keyboard, and it costs a bomb. But it's impressive, and Simon Rockman thinks it will sell.



PHOTOGRAPHY BY CHRIS BELL

Why did it cost Momena more than \$40 million to develop a machine which seems much the same as the pen-based machines from Grid, IBM, Samsung, NCR and Eden? The Momena doesn't even use the trendy power-saving Intel SL: it's based on a 20MHz 386SX. But inside there are some pretty neat tricks, tricks which explain where the \$40 million went.

Momena history goes back to the autumn of 1989, when Kamran Elahian, co-founder of the incredibly successful Cirrus Logic, met Shiraz Sivji, one of the few celebrities among the computer engineers in Silicon Valley. Shiraz was working for Tandon at the time. Before that he was a leading light at Atari, which he joined from Commodore, following the footsteps of Commodore leader Jack Tramiel. It is worth noting that there have been no major developments from Atari since Shiraz left three years ago — certainly nothing to compare with the ST he designed.

Shiraz and Kamran founded Momena with a mission to create an 'anytime, anywhere' computer. The project was financed by, among others, Associated Venture Investors, International Venture Partners, Sequoia Capital, Nazem and Company and The Walden Group in America, Mitsui from Japan and the Singapore Government (the machine being manufactured that city Singapore).

Momena claims it got more backing than any start-up in history — a tribute to the man responsible, Albert 'Rocky' Pimentel, who in his time has raised more than \$1 billion venture capital (and says he could do it again). Start-ups are fashionable in Silicon Valley, where companies shoot very quickly to either success or oblivion. Recent successes have included another Rocky coup, Conner, whose hard drives are used in the Momena.

Sleek design

The result of all this money, and two years' toil, is sleek and black — so sleek that Momena put out a special press release plugging Paul Brand, who designed the case. There are no knobs, buttons, LEDs or controls on the front, just a recessed grill for a microphone, and the copper Momena logo. Discreet sliders on the edge of the screen control brightness and contrast. An ergonomic highlight is that the sliders are indented to take the tip of the pen. The screen, which has an anti-glare coating, flips up for normal use with a keyboard and down for flat pen-based use. The disfiguring hinge is covered in rubber. This machine is smart enough to look at home on any boardroom table.

More conventional features are a power socket on the left side, towards the rear, and an almost ordinary array of ports under a flap at the back: keyboard (albeit non-standard), Centronics parallel, nine-pin serial, a US-standard phone socket for the internal modem, and an equivalent Euro-socket — blanked off on the review machine because the European modem was still undergoing approval. Momena expected to have German approval within a couple of weeks and anticipated no problems in the UK, because the circuitry was identical to that in modems already approved. Use of the modem and serial port is exclusive, so you cannot use a serial printer while on-line.

Which leaves out a awful lot of bits you would

expect to find on a notebook. There is no floppy disk, nor a floppy-disk connector (you have to use the parallel port). Neither is there a VGA socket for connecting a colour monitor, nor any way to connect one. You can daisy-chain a mouse NeXT-like into the keyboard (a partial explanation for the non-standard keyboard connector) but no mouse is supplied.

The plasticky keyboard doesn't share the rest of the system's quality feel, and lacks a numeric keypad, which makes it small (smaller than it looks in our photographs). It's also light, and despite having two rubber feet will skate on a shiny desk.

Supplementary machine

But the Momena isn't designed to be used like you use a desktop system. It is a supplementary machine: one that you can take to meetings with you, and take back your desktop system. And of course even the keyboard is supplementary to a pen-based machine. Writing on the screen, when it is hinged down, seems incredibly natural. The etched surface and copper-tipped pen together have the feel of a pencil on high quality paper. The copper wears away and tips are replaceable, the logic being that it's easier to replace tips than screens. Three spare tips come with the machine.

Under the screen is the reset button — pen controlled naturally. More important are the battery hatches. One contains a PP3 (or at least it will after setup... Momena follows Duracell's advice by supplying batteries separately). This preserves system information, such as the clock, during power-off, and also powers the system in standby mode when the main battery is drained or is being changed.

The main battery is a rechargeable stick. The machine bears a warning that only Momena rechargeables should be used, and two are supplied. This may change for the British market, for a curious reason. The machine is designed to take Nickel Cadmium, Nickel Metal Hydride or disposable Alkaline batteries — and they must be matched sets. If you were foolish enough to try to run the machine on eight good batteries and two duds, there is an outside chance the batteries will leak into the machine. Of course, dumb Europeans being no thinner on the ground than dumb Americans, this is as likely to happen here as across the pond. But the law here says this your look-out: Americans reach for the Yellow Pages and get as far as an attorney before stopping to think.

Elegant recharging

An elegant, intelligent recharging scheme, using a 6502-based custom IOP (IO processor), can fast-charge the batteries fully in 30 minutes. The IOP monitors the NiCad current flow by means of a very small resistor at the battery output. The charge rate drops sharply just before maximum charge, but trickles on until the maximum capacity (750ma) is attained. A thermistor will detect the heat of an overcharged battery and signal the IOP to stop charging. As a failsafe, the 386SX will intervene and stop charging after 45 minutes.

Nickel Metal Hydride batteries pose more of a problem since they do not exhibit the telltale drop in charge rate just short of maximum capacity. Their charge curves are, however, more predictable

so the system copes by storing the curves of the two major makes on ROM. Nickel Metal Hydride batteries are preferable because they offer longer life and are more eco-friendly. Unfortunately they are still too expensive.

When all else fails, the 9v PP3 will hold the fort. An exceptionally efficient DC-to-DC converter generates 18v, 5v and 3.3v from the one battery, but not for long, because even 10 fresh Duracells will last only six hours. Major power drains are the screen, the digitiser glued onto it, and the modem, which is powered down at every opportunity.

The system has six power states: on, sleep, deep sleep, standby, suspend and off. On and off are obvious, and off isn't used when there are batteries in the machine. If the CPU can be powered down the machine drops into sleep mode (3.3v). If it remains in this state for a while, the CPU powers down completely into deep sleep. An untouched machine will time-out into standby, which cuts off the screen and all other components except the IOP and RAM. The Momena will wake up at any input from the pen, keyboard, modem or serial port. After sitting in standby for a while, it falls into suspend. It can be reawakened only by pressing a button on the case or tapping the digitiser.

The IOP is low-power CMOS, its RAM is static, and there are diagnostic functions which use a piezo-electric beeper to signal system problems.

Digitiser

The digitiser, made of a hardened indium-tin-oxide grid, is bonded to the screen using a gel then baked and cured to form a single unit. It will work at 400dpi but few users can hold a pen to within a 400th of an inch. So, 200dpi is used, except when software stipulates a coarser resolution. Windows for Pen Computing (yuk, let's call it PenWindows) uses 100dpi.

To save power the screen is not backlit. Perhaps Momena, having cracked efficient DC-to-DC conversion, will now figure out a system for low-power backlighting.

Momena's choice of an SX over a lower power SL processor is surprising, given this stress on power management. The normal marketing line on this would be that the power-management system is so good that an SL is not needed. Momena's version has a thread of credibility: the company points out that its IOP system was designed by Bob Groppo, an ex-Intel engineer who knows the SL. Also, use of the SX gives Momena the option of using an AMD clone of the 386SX.

Making changes

Most changes to the system can be made without opening the case. You do need to take the cover off to upgrade RAM: four 1Mb SIMMs come as standard, but you can bring the total up to 10Mb by replacing two of these with 4Mb SIMMs. It is envisaged that machines may be shipped with 8Mb as standard, removing even the need to open the case — there is no co-processor provision.

More pressing is the need for a bigger hard drive. No Windows machine is going to be happy with 40Mb, and to expect two environments to share that space is asking a lot. When Momena ships in the UK there will be an 80Mb option. The delay

until now has been a lack of faith in the quality of Conner's 80Mb drives. A Momena source said this stemmed from inside information from Rocky Pimentel — and that, significantly, he has now given the 80Mb units the thumbs up.

Under the bonnet

There is more inside this machine than in any desktop I've seen recently. The only familiar parts are the Intel 80386SX and a Chips & Technologies P82C206 used for its DMA memory-controller functions. Other tasks are left to custom chips, to which the DMA functions will migrate as the design is revised.

Both the modem and the DC converter are on separate boards. A frame buffer allows the modem to send or receive without tying up the rest of the machine — the CPU may even power-down with the fax in use. The modem will run only at 2400bps, albeit with MNP5 and V42 error correction. The fax side, which operates at full Group 3 9600bps, is actually more important on this machine: software support for terminal types is quite weak.

Modem code is held in EEPROM, allowing upgrades to future standards. The lack of fast modem speeds is attributed to power consumption. It is envisaged that users will be able to download system upgrades from a bulletin board using a custom protocol in 9600bps mode.

An empty area of PCB next to the parallel port was to have held networking facilities, but this plan has been postponed for lack of standards. The preferred solution is a Xircom pocket Ethernet adaptor attached to the parallel port.

A speaker is hidden behind a vent on the right, next to the keyboard controller and the ribbon cable which leads to the hard drive under the PCB. The Flash EPROM lives on a butterfly board, plugged upside down onto the PCB. The system has 768K of ROM, expandable to 5Mb (though Momena doesn't see ROM-based applications as a priority). ROM and Flash EPROM can share the board but the Flash solution is easier to maintain. Momena uses an adapted AMI BIOS to give a traditional PCness. It makes sense to buy-in code, and Phoenix is tied to GO by having a BIOS for PenPoint machines.

One of the upgrades pencilled in for the machine is the ROM version of DOS 5, now known as DOS 5.1, which has been overdue for some months. A ribbon screen cable runs under the pen socket, which is in the centre of the hinge.

Codec circuitry, based on that used in the Sirius 1, handles voice input but lacks software support. There is no reason why the microphone cannot be used with the fax modem to provide voice-mail support, or act as an answering machine, allowing the executive user to make an office out of any hotel room.

Fast data route

The major components on the PCB are called Gabby and U2. Both are connected directly to the CPU, eschewing the 8MHz AT bus to pass signals around the machine at 20MHz. Gabby is the communications controller, with the twin goals of speed and low power consumption. The Gabby chip has a 16450-compatible serial channel, and drives the parallel port at high enough speeds for the Xircom

Ethernet adaptor to deliver a full 10Mb/sec. It has support for the (unused) networking features, provides four DMA channels, the IDE disk interface, support for the Codec sound module, and controls the power for all its associated peripherals. With a view to expansion Gabby is not tied to the 386SX; it will work with 286 and DX processors.

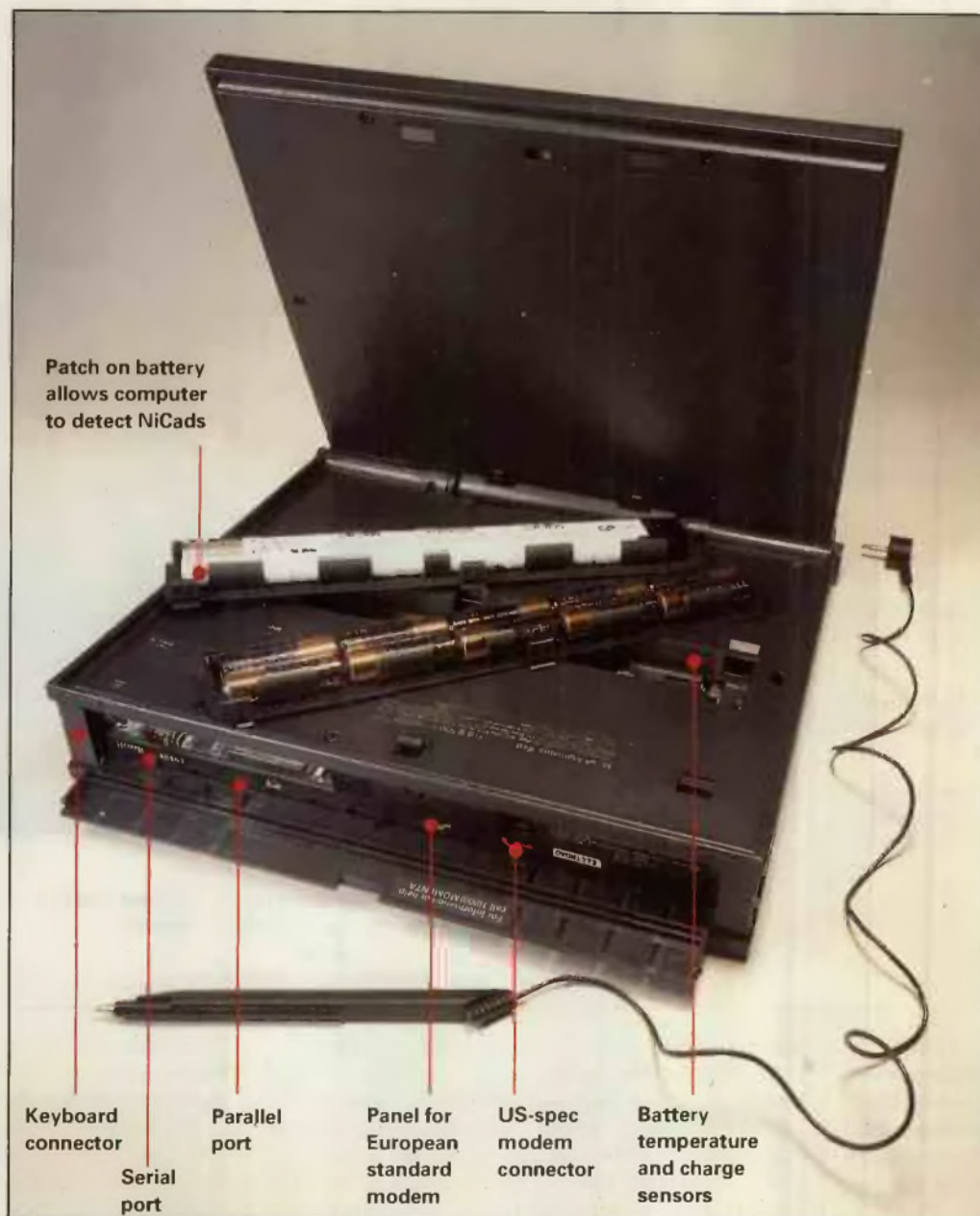
The U2 processor handles video output. One of the good things about using a pen on screen is that you can always see the pointer: it doesn't fade like a mouse cursor, but the Momena screen is still fast (that 20MHz bus again). The display supports 640x480 with 16 greyscales. The fast video hardware cuts the cost of the machine by using slower RAM; again there is an emphasis on power management, and U2 contains special circuitry to eliminate crosstalk which generates streaks on LCD screens.

Computer manufacturers often claim to have redesigned the PC from the ground up. But, the AMI BIOS and a couple of familiar chips notwithstanding, this is the first machine I've seen which can justify the claim. Novelty isn't used as a sales feature and there are risks associated with it: if I wanted to run a lot of DOS software, I'd want to make sure it worked on the Momena before buying. I'd have no such worries over Momena's own software, which will be good enough for most of the target market; nor would I worry about PenWindows.

Software

Software has taken half the development cost. Momena took on the task itself when it became clear that Microsoft would deliver PenWindows late. The Momena Software Environment (MSE) is Smalltalk-based, object oriented, and multi-tasks properly under DOS. To encourage developers, a two-week training course is available for anyone who wants to use the Momena Application Development Environment (MADE), described as 'a complete tool and workbench that speeds and economizes software creation'.

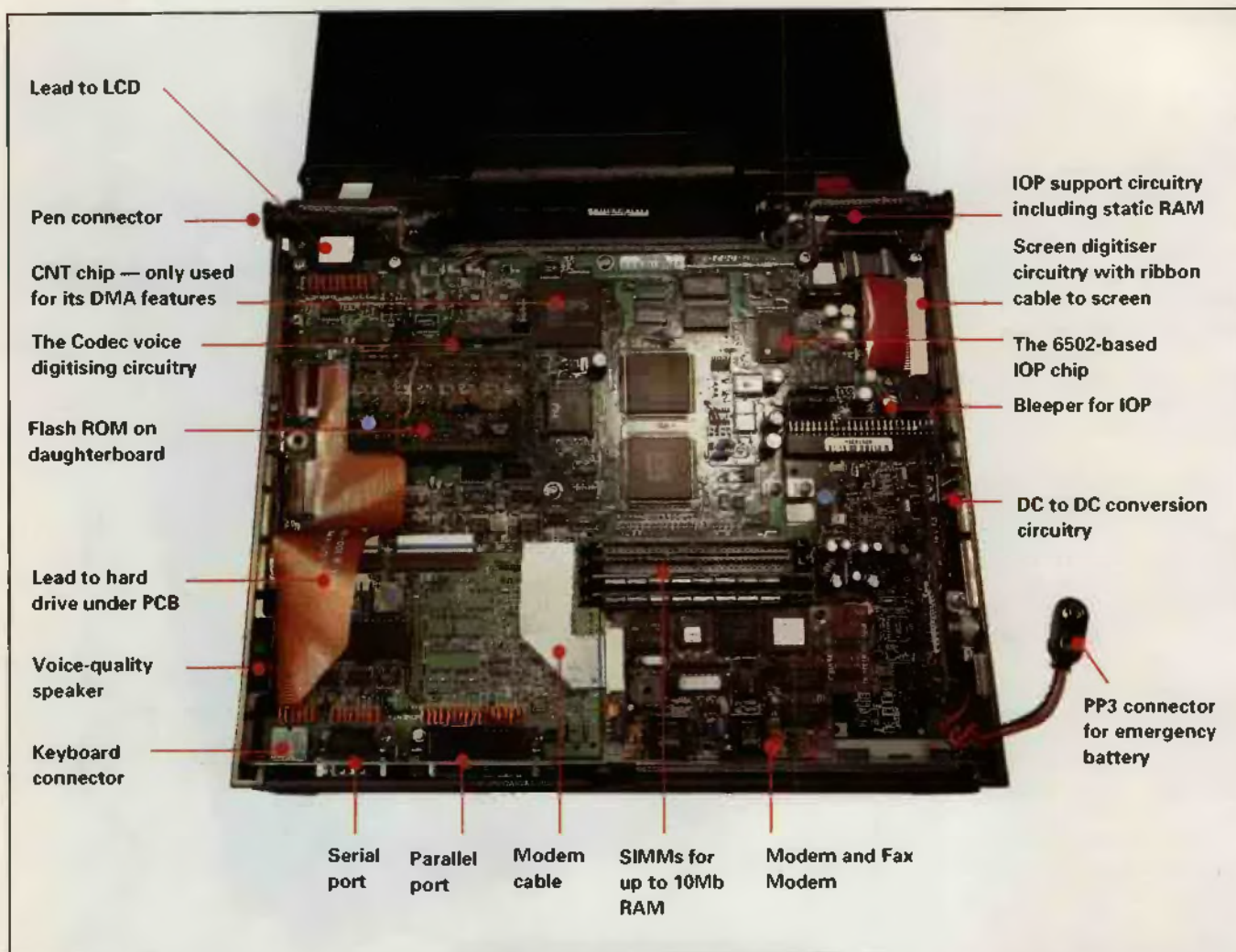
Switching from MSE to DOS is easy and quick. A soft keyboard appears on the screen when the machine drops into DOS. This Tappit keyboard is good enough for a lot of applications but the key-



board can be plugged in for heavy DOS usage. The software senses the keyboard, removes the Tappit and adjusts the screen size to suit.

Switching into Windows or PenWindows is more problematic. You need to reboot, because MSE's memory management software clashes with Windows' Himem.sys. Batch files automate the process, and Momena Software Environment will be reworked to live with Himem — perhaps before the UK machines ship.

Before I used the MSE, I thought the last thing the world needed was a new user interface. But Momena needed something to ship and MSE is good. It works well, linking the supplied programs and providing a sensible common user interface. Momena claims that the interface is intuitive because it uses 'muscle memory', the memory which allows us to drive a car and talk at the same time, or hit 'shortcut' keys without thinking. A pen, it is argued, is much more natural than a keyboard and



△ A late prototype was used for this photograph. It shows patch wires that are not present in the machines now shipping

so a repertoire of skills can be quickly built up.

Pivotal to the MSE design is the Command Compass. Select an object (a bit of text, a graphic, a menu heading, or whatever) and a dot appears in the centre. Pressing the dot produces a menu arranged like a pie chart. The segments show what actions can be taken: copy, delete, move. You select the action by sliding the pen to the relevant segment. With very little training — seconds rather than minutes — this becomes natural.

The one aspect I found confusing was that sliding *back* across the compass activates a different function, so to move a box to the left means selecting it, sliding right to hit 'move', and then describing an anti-clockwise arc over the compass to reach the point on the screen where you want the box. But even this became second nature. There is no window sizing but that doesn't seem to matter.

Handwriting recognition

The Momenta is as good (or bad) at handwriting recognition as the GO machine reviewed in last April's issue of *PCW*. You have to train the machine, using a program that takes you through a long script, and it takes a while to analyse the resulting data. Two programs cater for problems with individual characters.

Like all handwriting recognition schemes, stroke order is more important than the end result. So if you write the letter 'O' both clockwise and anti-

clockwise, you will need to teach the machine both forms. You can use many of the machine's functions without handwriting.

The training is simple and fun. Several users can be registered to a machine, and once the software is trained you can embark on using the applications. Again, the emphasis is on the busy executive. Grid's users are blue-collar, but the Momenta customer is more likely to have a Gucci shirt. To this end the major applications are PenCell and Presenter. PenCell is a spreadsheet from PenWare, a third-party company based in San Jose. It will read Lotus WK1 and WKS sheets and uses MSE fonts.

I don't use spreadsheets often enough to judge which of the features the typical user would want, and with only 39 operations PenCell isn't as feature rich as Excel, nor does it have the MSE command compass. But it does have the basic features, including charting, that you would expect. The major selling points are an 'object-oriented' unlimited Undo and an English-like macro language. Versions for PenWindows and Penpoint are under development.

Presenter is the object oriented graphics program. It will do some shape recognition — a shape drawn like a 7 becomes a square and a loop a mathematical ellipse. There is Momenta font support, but the program is no PowerPoint or Corel. The biggest omission from the machines I saw, and those being shipped in Germany and the US, is



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MARCH 1992 PERSONAL COMPUTER WORLD

Memo. This is the handwriting recognition word processor, to enable you to scribble notes on a plane and include them in a report later. Memo has been withdrawn and will be reintroduced when some bugs are fixed — again, perhaps in time for the UK launch.

Meanwhile you can use NoteTaker, a freehand notepad. Designed to be used for notetaking in meetings, it has ruled lines and makes no attempt to do anything with your doodles of the chairman.

Personal organisers

There are two personal organiser programs, address book and calendar. Address book is important as the phone book for the fax board. Any page from any application can be sent to the fax or printer. If either of these are disconnected the pages are held until you get back to your base. The calendar is a freeform text system — there's no point in making personal notes look neat. It will repeat events intelligently, so you can schedule a meeting for the first Thursday of every month or every four weeks. An alarm can be set to remind you five minutes or an hour before the meeting.

The system setup software takes care of things like the printer drivers for all the MSE applications. A major omission is PostScript support, but this is promised.

While DOS is a link to the past, the choice between PenWindows and MSE is not quite so clearcut. PenWindows doesn't exist yet, and given Microsoft's past record it might be some time coming. When it does appear, a huge number of Windows applications will be able to make use of it and there should quite rapidly be a base of applications adapted to exploit pen computing.

Developers writing for MSE will have to content themselves with a market limited to the machines of one manufacturer. This was deemed normal in the pre-DOS days and if Momena sells the quantities needed to justify the investment, there should be a large enough market. If PenWindows takes off faster than the Momena, MSE will have served a function as a stop-gap and the machine can ride on the back of the Microsoft product. If the Momena takes off before PenWindows ships, MSE will be crucial to its success — no-one really wants the crude DOS solutions offered by Grid or NCR.

Whatever happens, MSE is expected to remain as Momena's choice for programming its machine and will continue to be used for the system configuration software.

Conclusion

Momena the company is impressive. The European headquarters in Frankfurt is run by Jurgen Tepper, who pumped life into Tandon. There are other Tandon people around and a fair mix from the industry, spanning Apple to Zenith. Those I spoke to had a very real belief that what they are doing is going to be huge. For the most part they have taken pay cuts and shareholdings to become part of Momena. The offices are not flash and the money has clearly been spent carefully.

Momena the machine is also impressive — it is refreshing to find a machine that is genuinely different. Yes, it is still a 386 box, but the approach is innovative. Some ideas, like a panel which fits on

an overhead projector and uses solar cells to charge the batteries, have not been implemented yet. One idea I particularly liked (and which alas won't be used) is the addition of a photo sensor to a machine with a screen that can be laid on a photocopier. After the screen has been copied, the sensor changes the display to present the next screen for copying.

The carrying case is smart and can be supplemented by a saddlebag. This is a poncho-like arrangement which accepts the carrying handle of the normal case through a hole in the centre, and hangs bags for the keyboard, manual and PSU over the sides. Again, good, stylish design.

The UK price of the Momena system has not been set. It is shipping in the US at \$5000 and in Germany at 9999DM. Our review machine had a declared customs value of £2800 to which you have to add around £500 duty and VAT. I'd hazard that the final price here will be of the order of £3500, making it a good deal more expensive than most notebooks; and you are unlikely to find it discounted — initially, at least.

But this machine should thrive on such exclusivity. It needs better software but that will come. It is right for its market and it's a real achievement, outclassing Grid, IBM, Samsung, NCR and Eden. But then, it did cost over \$40m.

Specifications

Momena

Supplier

Momena, 295 North Bernardo Ave, Mountain View, CA 94043, USA. Tel: 0101-415 969 3876

Processor

Intel 20MHz 80386SX, aided by custom 65C02/RISC processor

RAM

4Mb expandable to 10Mb

ROM

768K expandable to 5Mb

Mass storage

40Mb hard disk, 80Mb option available soon

Storage options

Floppy disk

Monitor/display

640 x 480 with 16 greyscales. Backlit version available later in the year

Standard interfaces

RS232, parallel, fax and modem (seeking UK approval)

Expansion

None

Size

262x300mm. Depth: 60mm rear, 70mm front

Weight

3.18kg

Bundled software

Windows (PenWindows when available), MSE, PenCell, Memo, Notetaker, Presenter

O/S

DOS 5.0 (5.1 when available) with Smalltalk or Windows

Peripherals

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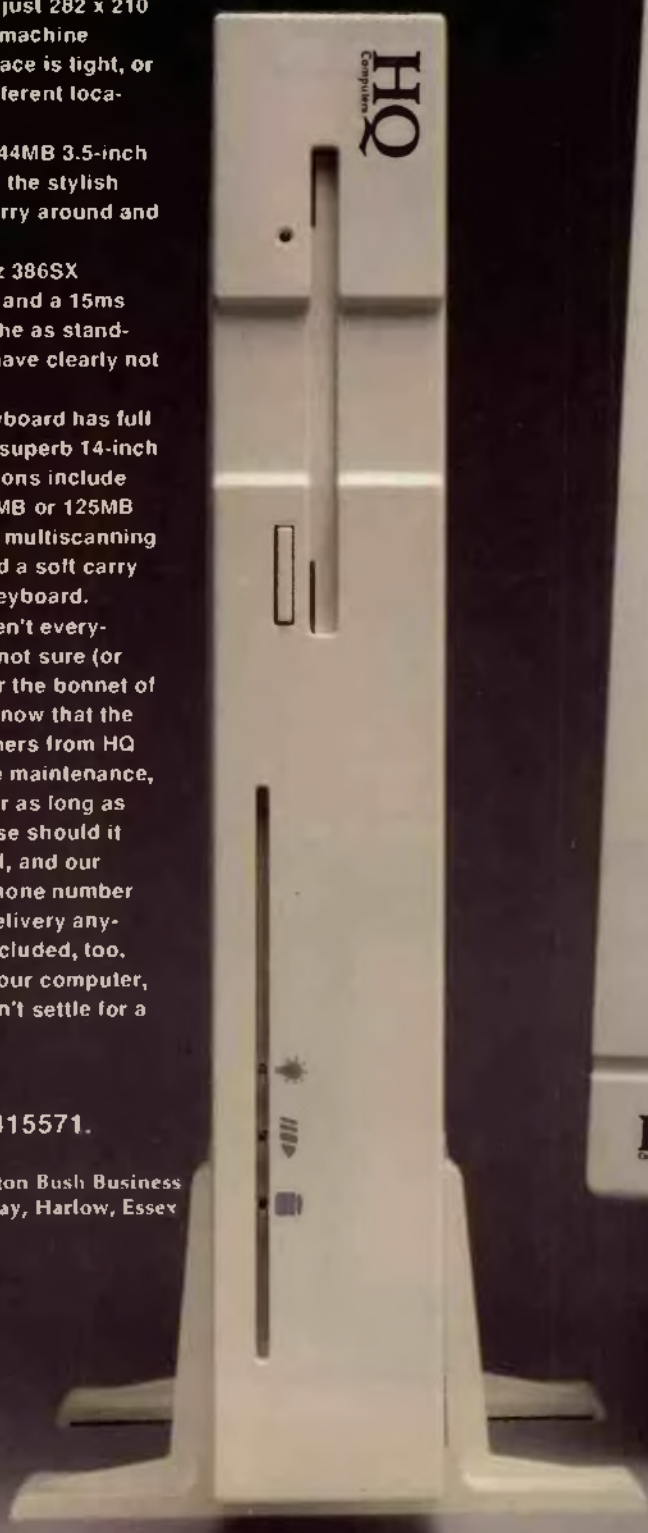
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Omnis 7 Plus for the Macintosh

Blyth's Omnis 7 has a 'history': it is several years old, and in some places its technology is looking decidedly long in the tooth. Steve Cassidy tackled the application builder environment of the new Mac version head on, and found that its roots are showing.

The market in large Mac software packages has definitely stepped up a gear or two since I came to it just when the Mac II first appeared. Credibility for the platform as a sensible corporate solution has undoubtedly increased since the box went from being cute and impenetrable to being large, colourful and held closed by a self-tapping screw.

Corporate people do some things that smaller users, be they business or personal, certainly don't: keeping tons of records ranks high on that list. Omnis 7 is the latest in the line of products from Blyth Software which aims to satisfy this corporate

I only looked at the Mac version so we won't be testing the inter-platform claims here. Instead, let's see how this new release faces up as a Mac application builder.

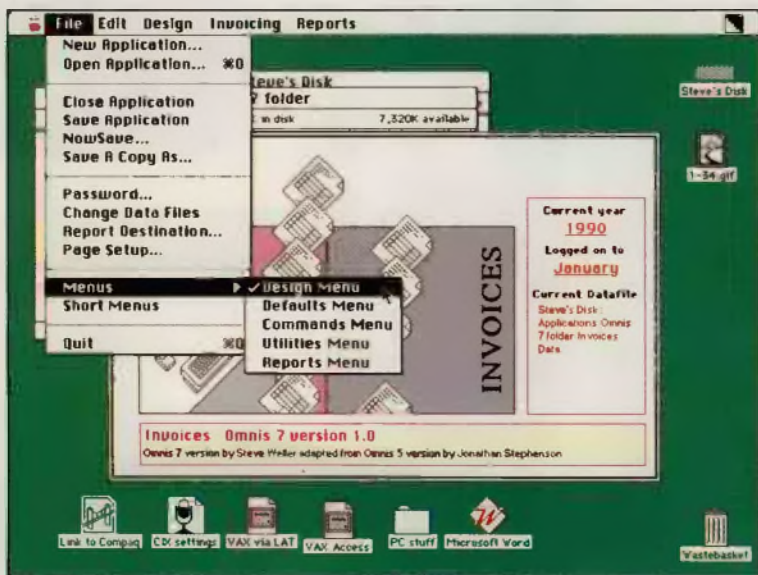
The forces of darkness

I'm sure it's no coincidence that the box which releases the forces of darkness in Clive Barker's *Hellraiser* is roughly the size and shape of a 3.5in disk box designed by Heironymous Bosch: in the case of Omnis 7, there's not just the disk wallet in the colour-coordinated packet, but also a plethora of marketing material whose chief purpose seems to be to hide the small, flimsy sticker which carries the product's serial number. Do not, the manual warns, lose the serial number.

Once past half the Amazon forest, one is presented with just three 800K floppy disks. Since this was the full development version, this made each disk worth roughly £500. The install program takes its lead from the usual Apple installer: you're asked where the Omnis folder is to live, and then matters are taken out of your hands while files segmented across the install set are copied into the right places.

In common with one or two other recent offerings, there are dire warnings at the start of the install procedure in connection with Symantec's anti-virus package, SAM. This can be configured to scan and optionally reject any floppy if it thinks the disk is infected with any known virus, and also to flash the screen, squawk and prevent any resources of type CODE being added to a file on any disk. Both these strategies will foul up almost any install program, either when it asks for the next disk, or when the final executable is built from the components segmented onto different floppies. Omnis Installer suggests you turn off all SAM protection for the duration of the install procedure.

Many corporates I know have all forms of SAM protection switched on; one would almost think they trust the 'passive' disk scan over and above the



△ The cascading menus show which menus you can get to but not see in the menu bar

craving, with the claimed USP of operating both on and across the range of platforms which a DP department find themselves shepherding. If the bumpf is to be believed, the Mac, MS Windows, IBM OS/2 and Unix all have not just their own versions of Omnis 7, but can share procedure code and file formats to the point of utter transparency.

'active' function and resource manager bypass monitor parts of the system, and this strategy alone would make casual installation of Omnis a job not suited to the faint-hearted.

What You Get for What You Pay

Virus trappers circumvented, space sequestered, you wind up with 3Mb of Omnis program and assorted example files. Double clicking on the Omnis executable file itself leads to a very low-key and somewhat confusing start: all that displays is a brief trademark banner and then a couple of menu headers — File and Edit.

It's here, straight away, that the strategy implicit in Omnis becomes clear. This is a tool for building fully-fledged applications, not a gadget for the tentative dabbler in databases and constructions. In order to get to any further menus, you must become embroiled in the Omnis 7 approach to data analysis and design.

This is detailed in the *Getting Started* manual, a mere slip of a 200-page introduction when compared with the 350-page *Application Designer's Handbook* and *Programmer's Reference Guide* which make up the balance of the documentation. 'Getting Started' begins with an exposition of the pretty standard 'these are fields; fields make up files; files make up databases' PC level version of relational databases.

Starting from the simplest construct in that pyramid of relationships, Omnis now supports some modern data types such as the unspecified binary field. The concept of a binary field goes hand in hand with Graphic User Interfaces — just displaying your data in nice fonts on a big screen isn't enough. How much nicer to be able to carry a picture of your client or staff member along with their National Insurance code; how much nicer to have not just a picture, but also a sound sample of the Smaller Crested Grebe in your database of All Britain's Birds. At least, that's the idea: actually handling fields of type 'binary' is left entirely as an exercise for the developer. If it isn't possible to predict what is contained within a binary field, Omnis quite fairly makes no promises to display, edit or otherwise fiddle with the field.

The Binary field is described as separate from a field of type Picture, which may be a PICT file or PICT object from the clipboard on the Mac. There's a somewhat shamefaced caveat in the *Application Designer's Handbook* which warns that conversion of this field type from Mac platforms to others is one-way, and results in a black and white bitmap on all platforms; as soon as a file is declared to be multi-user and multi-platform, most of the reasons for using this type in preference to Binary go out of the window.

Standing out from the crowd

Other data types which stood out from the normal crowd are National, and List. National is a subclass of the Character String type: like Strings, it's limited to 32K in length; it differs in that when used as a sort or index key, it is collated according to the prevailing 'national character set', ensuring correct sort orders for alphabets other than UK English. This gave me some pause for thought: it's clear that Blyth has done this by looking at the setup of the applica-

tion and the Mac running the program, and has included a collation table to map character codes to sort orders. What I found strange was the concept of someone, a Dane or a German, using anything other than the National String type: for them, using Character Strings would be equivalent to asking for an incorrect sorting order. Why separate National from Character String, as a type?

The List data type seems at first to promise great things. It is described as a data structure which allows information to be manipulated as an array; the catch is that it's you, the developer, who gets the task of doing all that manipulating. Lists can have up to 255 fields contained within them, each of which may optionally be mapped to a field in the file definition, or be filled at runtime by the programmer in his or her script.

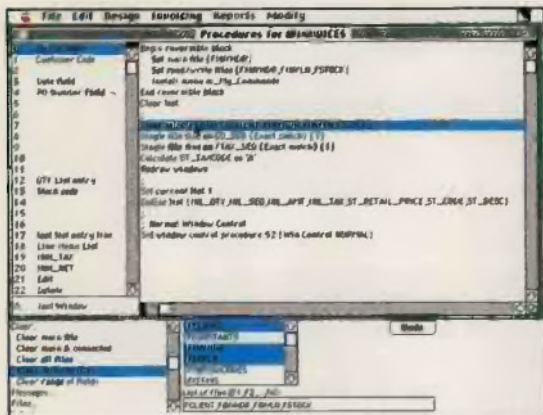
Form design

In WYSIWYG systems, the place of the old-fashioned Database Form is taken instead by a Window. Omnis allows all flavours of Mac window to be created, with or without scroll bars or other normal window control impedimenta. The window design environment takes some cues from the Hypercard model, in having a tool palette to the left and a blank window in which to work midscreen. As objects of various types are placed in the designing window, large, modeless dialog boxes appear and disappear below these two regions. These contain a list of the current types of object which may be placed, or the variables available for relating to an input or display field, and the name and other peripheral attributes of the field in question.

I tested Omnis 7 initially on my trusty 030-accelerated SE at home, before moving on to the equally trusty IICI 5/80 with 13in colour monitor which puts up with me every day. It was the form design phase, along with the code writing phase,

which convinced me that the days of the small-screen Macs are numbered if Omnis is any guide. The elements of the form design function which receive most of your efforts are the two modeless dialogs at the bottom of the screen, and on the SE these are only just fitted into the appropriate space. Similar programs such as Foxbase, and even

△ The report designer environment shows segments for repeating fields in grey bars



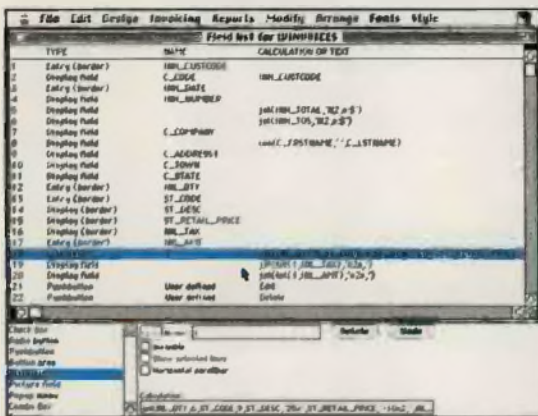
△ The programming environment incorporates a fixed dialog box with its own syntax outliner

then redraws each dialog as different placed fields on the design are given and relinquish focus with a mouse-click.

Furthermore, there's no little mitten control to drag the logical workspace around the physical screen window — something MacPaint, a far simpler and less important program, has had since 1984. The way to obtain a movable physical window over a larger logical design space is to pop off

Hypercard itself, satisfy the need for interaction with the user by popping up dialog boxes and windows over the top of the form (or card) being designed. Omnis takes care not to overlap the dialogs with the window being designed, and yet vanishes and redraws each dialog as different placed fields on the design are given and relinquish focus with a mouse-click.

Furthermore, there's no little mitten control to drag the logical workspace around the physical screen window — something MacPaint, a far simpler and less important program, has had since 1984. The way to obtain a movable physical window over a larger logical design space is to pop off



△ The data definition dialog with its fixed dialog box showing the options

stead be objects added to the design? My answer would be that plenty of other offerings manage this feat; if I were being uncharitable I might offer the guess that the strange 'modeless dialog' method of setting field attributes was a byproduct of platform independence, dialog handling and mode setting being two things which vary widely between GUI platforms.

Night moves

At this stage in the 'sit and take notes' phase of the review, I needed to take a ten-minute bike ride in the middle of the night. This happens very seldom, and it's normally brought on by an outbreak of stupidity on my part. In this case, I had seen the entry 'Long Menus' in the bottom of Omnis 7's File menu. I thought that might have been why I had only seen the two menus I mentioned at the start, so I selected Long Menus and proceeded to evaluate the product on the assumption that, like other Mac programs with Full/Short menu structures, Omnis offers all the Short menu features within the Full menu structure.

Not at all. When looked at using Long Menus, Omnis appears to be a development environment, with such appurtenances as a highly developed debugger and the aforementioned bare-bones Form

designer. When looked at using Short Menus, however, many of those features disappear, much as one would expect. What is disturbing is that many other features appear, including the one which automatically creates a form from a supplied file definition. Which is to say that 'Short Menus' doesn't actually mean 'Short Menus': it means 'Easy environment'.

Another way of putting this might be that you are not encouraged to wander off and fiddle for yourself, without first reading the manual. This is the very first Mac application which has driven me to a sufficient peak of frustration to enforce a break and a breath of fresh air.

So, while the Form Designer might be very manual and very awkward to set in motion when in Long Menus mode, it's easy and fast to build layouts by flipping back into 'Short Menus' mode. Obvious, really...

Programming language

There's an awful lot of keywords in Omnis 7. It's plain that very nearly all the effort, and certainly all the empathy of the developers, has gone into the programming language of the product. A large portion of the success of Omnis in previous versions has been the readiness of developers to use it as a platform for delivering vertical market applications. A browse through Mac ProductFinder, the Hypercard stack given away with every new Mac, reveals many accounting, salary and stock control systems delivered using Omnis as the platform.

Application code is written using the Omnis editor: this bears only a passing resemblance to a standard Mac TextEdit window, and doesn't fit or resize to the SE/Classic sized screen. On a 13in colour monitor, it all starts to make more sense. Procedures, as they are termed, are accessed via the Modify menu (so make sure you have Long Menus turned on). The editing environment once again takes the form of a scrolling list of all the procedures in the current application on the left, and the code of the chosen procedure to the right.

There are up to 255 numbered slots for procedures to occupy: to call one procedure from another, you refer to the procedure slot number. As you select each line in a procedure, a modeless dialog at the bottom of the screen changes state to reflect the syntax of the contents of the line being worked on. All the available command elements are listed in a low-profile outliner view, by category of function: click on the 'Redraw...' heading and all the redraw-related commands appear below. Confusingly, unlike the form designer structure box, the dialog or workspace for procedure code construction doesn't vanish and then redraw according to whether you have a line selected or not.

Despite my reservations about some of the user interface conventions employed, there's no doubt that this is a powerful way to work with code. Limitations of the language necessitate some aspects of this structure, mostly concerned with packaging up procedures, parameter passing between procedures (by depositing your values in system-wide variables with fixed single-character names like #L1), and the restriction of inter-procedure calling to the use of procedure numbers: even BASIC now allows a call by label or procedure



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name, which enhances readability considerably. By comparison, in Omnis you must say 'Call 240 [window management code]', where the curly brackets denote a comment.

Like all the other features of Omnis, the report writer emerges upon you gradually. At the outset its structure is largely hidden, but it doesn't take much

ject of the Mac user interface and feel, and the man-centuries of research behind them, it seems sadly typical of smaller third-party developers that Blyth and the writers of the examples have trodden their own path through the no-man's land in between the various 'standard' platforms they support.

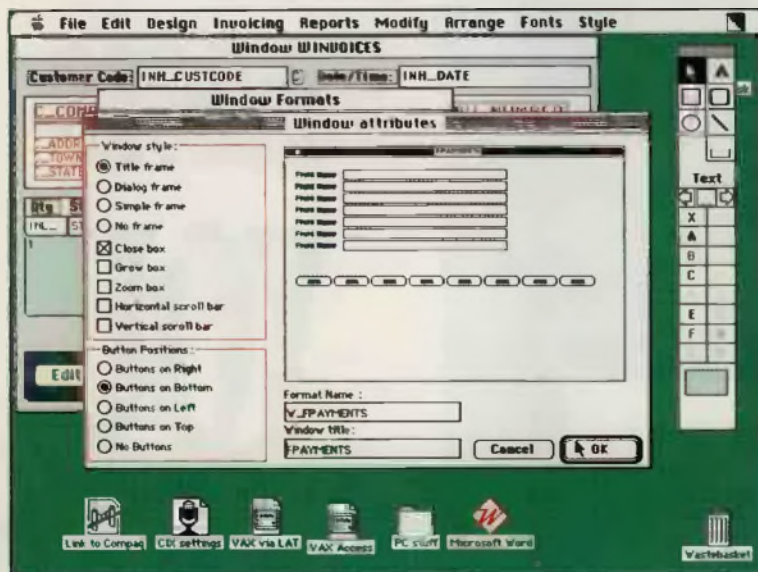
Conclusion

As a mature product, Omnis 7 shows clear signs of having a 'history': its roots are several years old, and in several places the technology being used to provide a function has been comprehensively outdated by competing products. In particular, it's clear that nobody has looked at the overall layout of the application builder environment. Menu entries are not greyed when they are not applicable: instead they vanish altogether, leaving the new user with the feeling that he/she is stuck in a maze of twisty little menus, all alike. No doubt this is an 'Omnis standard', and long-term Omnis developers will upbraid me for a tendency to think like a namby-pamby user; but I see no reason for the application builder environment to whip menus out from under the developer, just so that the runtime environment can do the same for users of the eventual vertical application.

There are clearly no references to any kinds of object-oriented design philosophies, in the way that files are linked by fields or in the use of 'global variables' with names like #F1, a strategy which reminds me of BASIC+ on a PDP-11/70. The packaging of code within an all-encompassing application file is definitely handy, and the various facilities of the programming environment counter the relative crudity of the language itself.

While there's no doubt that Object Orientation is a powerful and valuable tool, it requires a quick and appropriately schooled mind to take advantage of an O-O architecture. The success of Omnis as a delivery platform for vertical applications clearly draws some of its fan mail through its somewhat unstructured approach: if you want a single field from a single file to show on a form, you can place that field on the fly as long as you're prepared to do the donkey work of looking up its contents within your procedure code. There's no-one with an O-O rulebook tut-tutting at you for doing something inelegant.

The sad part of both Omnis and applications delivered by workers with Omnis is that the conscious Design — the packaging of ideas within software which comes free as part of Object Oriented disciplines — can all too easily be left out of the final product. This seemingly intangible shortcoming is most evident in the examples, and is by definition a very difficult thing to get across to the kind of boffin at whom Omnis is targeted.



△ This dialog lets you automatically generate a form from a file layout. It is accessible only in 'Short Menus' mode

to winkle out the full power of this part of the program. Report fields are not just restricted to fields present in files you associate with the report: calculations and 'virtual fields', which mean much the same thing, are permitted, as are callbacks to procedures within the application which contains the report, so that each line of a repeating region of a report can be the result of a further lookup or complex relationship.

System 7 features

The manuals make some mention of the provision of mechanisms to support Publish & Subscribe and IAC (Inter-Application Communications), the two main advances System 7 has delivered in the field of document update and program control. In practice, Publish & Subscribe is delivered as if a Publish command were an alternative output stream, alongside the current printer or the screen or the clipboard. Command verbs are included in the language to listen for subscription requests and drive publishing functions: aside from the choice of Report destinations, one may publish a field, list of fields or an entire file.

Monitoring the Apple Events system command and status message function is also covered, as is balloon help within the menu construction utility. The examples are however somewhat haphazard in their design and approach, not making use of the new features offered by System 7, and in several cases looking hardly at all like a Mac program. Given the huge piles of CD-ROMs which can be coaxed from Apple, dedicated to the sub-

Prices & contact

Omnis 7 Plus Development Kit English version	£1500
Omnis 7 Plus Development Kit German or French Version	£1725
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The exact configuration was not settled in the review machine (with the result that there was nowhere to plug in the mouse supplied; no doubt this will not happen in a commercially available version).

There is ventilation on both sides, with some slight fan noise. At the front there is the 3 1/4 in drive plus

LEDs for the hard disk and floppy disk drive. All HM Systems PCs have SuperVGA as standard. The review machine used a SuperVGA monitor, although of course a standard VGA monitor will still be compatible. When using intensive graphics-based software, SuperVGA is a real benefit, and most Windows users will notice the difference as well. Put simply, if you can get twice the information on screen, Windows multitasking is twice as easy.

The keyboard is sound, with quite a lot of travel. The general construction is very solid, and the Minstrel has the power and special features to act as a specialist graphics workstation, while retaining the price performance which makes it attractive to most users. The clincher is that HM Systems has realised that fast data access and fast video will be worth more in performance terms than their cost.

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HM Systems Minstrel	D	1,380	25	2.16	Dos 4.01	50,100,240	13.0	9.7	1,340	0.2	0.2	62.2	7.6
Data Dynamics 386SX-20	T	1,440	20	4.8	DR Dos 5.0	40,80,135, 180	12.5	7.6	223	5.5	31.1	42.5	4.8
Tulip Vision Line dc.386SX	D	1,925	20	2.16	Dos 4.01/Windows	40,100	10.2	7.8	780	1.5	24.5	104.8	6.2
Compuadd 320ec	D	1,099	20	1.4	Dos 4.01/Windows	40,80,110	7.8	5.1	3,320	13.7	14.3	42.5	4.2
Acer 1120SX	D	2,108	20	2.8	Dos 4.01/Windows	40,100	10.3	7.7	5,860	5.6	28.9	42.5	5.7
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Facitum 386-20SX	D	1,185	20	1.8	DR Dos 5.0/Lucid 3D	40,80 & others	9.0	7.8	846	10.4	23.7	45.0	5.9
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			MICROSOFT QUICK BASIC	£159	PRO0098							MICROSOFT DOS 3.3 WORKSPACE	£29	UTL0098
			MICROSOFT QUICK BASIC	£159	PRO0099							MICROSOFT DOS 3.3 WORKSPACE	£29	UTL0099
			MICROSOFT QUICK BASIC	£159	PRO0100							MICROSOFT DOS 3.3 WORKSPACE	£29	UTL0100



Untouchable

Fifth Generation's new anti-virus utility arrived almost drowning in its own hype. Tony Capelli found that it didn't need exaggerating: this is a competent, if not startling, file guardian — and not notably better than rivals in a crowded (largely uninfected) market.

Fifth Generation Systems is slowly building up perhaps the most comprehensive utilities portfolio available from a single software publisher — not excluding better-known rivals Norton and Central Point. It is most famous for the backup program, Fastback Plus. It bought in Paul Mace's utility range and the file transfer program Brooklyn Bridge. File Director (a DOS file manager), Logical Connection Plus and Jr (a pair of printer sharers), Direct Access (a sophisticated menuing system), Disklock (a data security system), and Pyro (the pyrotechnic screen saver) complete the company's PC range (there is a similar Mac collection). The only obvious omission is a virus detector.

Bridging the gap

True to recent form, Fifth Generation has bridged the gap by buying in a suitable package, called Untouchable. The original publisher, BRM, has no connection so far as I'm aware with British Racing Motors, builders of hideously complex but gorgeous-sounding 16-cylinder Formula One engines. Nonetheless, if there is only half-truth in the claims Fifth Generation is making for Untouchable, the technical achievement may be just as great. Let's

just hope it proves more reliable.

That BRM Technologies retains a copyright message on startup is a little odd. If the manual is to be believed, BRM 'simply' wrote the code on a contract basis: the project was coordinated by Fifth Generation Systems. If the hype surrounding this package proves unjustified, I guess it will help to have an easily identifiable scapegoat.

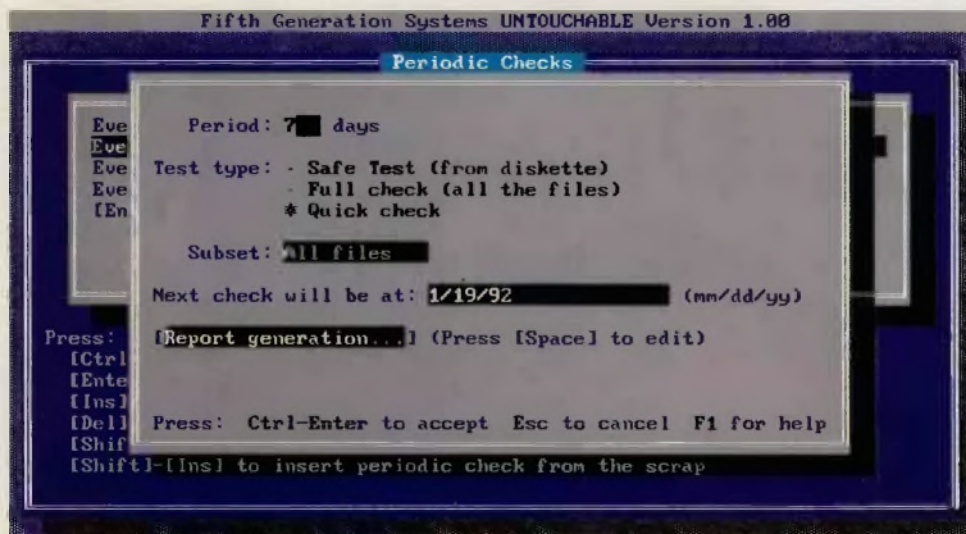
The blurb says Untouchable will detect 100% of PC viruses, for ever, without updates. It isn't PCW's style to regurgitate press releases, and the one that came with this package seems related more to the byproducts of ruminants than to objective journalism. But knowing what a hard-bitten, sceptical lot you are, I think you might enjoy reading a sample:

- 'This product is the first of its kind on the market to offer solid, 100% protection against all computer viruses... it doesn't need updating.'

- How does it work? 'All the files on a machine have parts of their code (or 'signature') stored in two databases that are created by Untouchable. Alterations to these codes indicate that files have been infected... Rather than checking for known viruses, Untouchable checks for 'unhealthy' alterations to existing files. Logically, these changes must be caused by a virus. Because Untouchable scans files regularly without any prompting, any infections are picked up very quickly... because the software's removal technology relies on information contained in the user's own files and not on the virus 'signatures'... Untouchable guarantees 100% restoration of recoverable infected files, including those hit by unknown viruses.'

Not much of a claim that last one, is it? Rather like the AA guaranteeing to fix 100% of the cars it can fix. And note that Untouchable is the first of its kind to offer 100% protection — other kinds presumably don't count. So now we've determined the gender of

▽ You aren't stuck with the default testing options. You can alter tests, add them and change the due date



the ruminatory animal whose waste products this stuff, apparently, resembles.

What makes Fifth Generation so keen to spout this twaddle? Either it is very, very confident of its product, or it just doesn't care if it is made to look very silly in the specialist press.

Essentially, then, Fifth Generation claims that Untouchable will detect all viruses, whether or not they currently exist. It will, in more cases than not, recover corrupt files, even those corrupted by an unknown virus. Perhaps best of all, as a consequence of the detection technology, it won't report the presence of a virus on a sterile machine, an all too common event on rival products.

One final word from the press release: 'The market is crowded. It is crowded with rubbish—rubbish products that give too many false alarms and only respond to known viruses.' If you stick your neck out that far, you'd better be sure it's strong enough to support your inflated head.

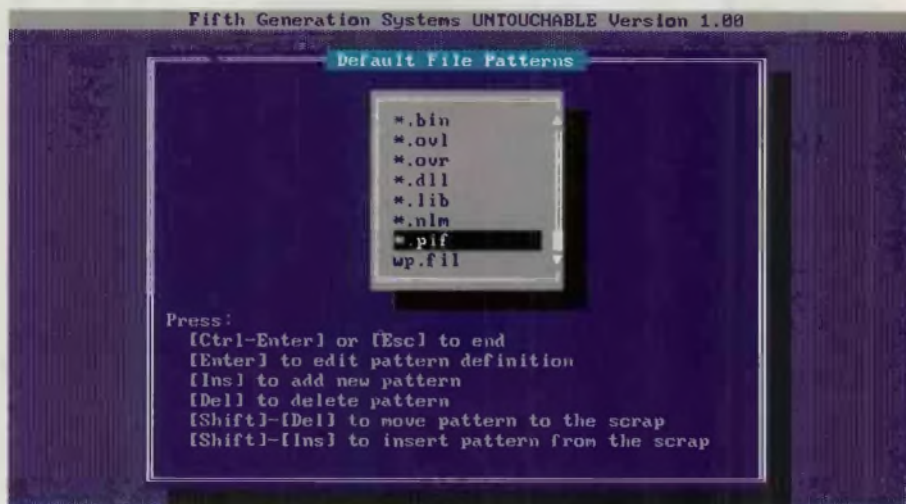
Technology

Unlike some companies, Fifth Generation is very open about the way Untouchable works. That's just as well, because its claims need a convincing sounding explanation, at the very least. They get one.

There are three distinct parts to Untouchable: two conventional parts, plus one simple, obvious-when-you-know-how, and allegedly unique, part.

The two standard methods are a utility called UTRes that simply sits in memory after boot-up and inspects memory-resident programs (TSRs) against

the signatures of known viruses. (Most viruses set up a TSR, running invisibly in background memory.) UTRes will, of course, warn you in the event of infection.



The second, called UTScan, scans the hard disk for the signatures of known viruses and removes any it spots. This is run during installation. After that it must be called from the command line, usually to remove from the disk any virus the TSR has spotted in memory.

Detecting modifications

The clever bit is a scanner, which uses what Fifth Generation claims is a 'mathematically proven' method of detecting any modifications to any of the files on your hard disk. The scanner can be run from the command line, but as a default is set to run every day on your system files (that is, files present in

△ The list of 'executable' files is pretty comprehensive, but can be extended without too much trouble

The Virus Epidemic

Despite scare stories in both the specialist and the popular press, the virus threat to PC users is not a very serious one—though there are undoubtedly hundreds of viruses in existence.

Most viruses really do seem to be written as an intellectual challenge, rather than as a plot to destroy Life As We Know It. It isn't much of a challenge, of course, because all of those circulated so far have been discovered—so far as we know. But writing one can help kill a couple of hours.

That doesn't mean precautions aren't worth taking. There are malicious viruses in circulation and there will always be the potential for a really destructive strain to break loose. A good detection program is a sensible precaution, if you can live with the inevitable false alarms.

It isn't just that the viruses are mostly benign. The fact is that producing an efficient, fast-spreading PC virus is virtually impossible. The chances of most users contracting one is small.

To see why that is so, it is worth looking briefly at propagation methods, both on the PC and machines like the Macintosh and the Amiga.

On a PC, there are three basic methods. The first two, arguably the most efficient, are also the easiest to spot. By inserting the propagation software either into the hard disk's boot sector or into COMMAND.COM, the program will be run every time the PC is rebooted. How it got there is another question; most likely it will have come from the boot sector of a floppy (write-protecting disks will ensure that, even if your hard disk does become infected, your floppy collection shouldn't). But it could have come from an executable program.

The third method is the most subtle. You download a public domain utility from a bulletin board and run it. It does something useful, like find files anywhere on your hard disk, but it also picks one or two other EXE or COM files and attaches itself to them. Now, whenever any of those infected files is run, the virus spreads further.

All very clever, but simple precautions can stop infection and fairly unsophisticated software is capable of spotting the damage—even if recovery is a little more tricky. So why the panic? The problem is that on machines with

more sophisticated operating systems than the PC, viruses are a real and almost unstoppable problem. Put a disk in a Macintosh or an Amiga, and as soon as it is inserted, the operating system checks to see what it is. If a virus has attached itself to the operating system, it is a simple job to replicate itself to the floppy.

To make matters worse, both Apple and Commodore encouraged distribution of the system files on bootable disks. An infected, bootable disk can cause all sorts of problems. Add to that the fact that software piracy is rife, particularly on the Commodore Amiga, and you have a recipe for a very serious problem.

So, if you are fortunate enough to have a machine as unsophisticated as a PC and if you only ever use legitimate, commercial software and never boot from floppy drives, the chances of infection are minimal. That doesn't mean, of course, that a malicious employee at a multinational software company couldn't add a virus to the final disks of a new product, just before duplication...



Δ UTScan checks the hard disk for known strains of virus

▽ The 'Gisborne virus' at work: modifying a file, using XTree Gold

AUTOEXEC and CONFIG.SYS) and once a week on the program files across the entire disk, using its signature database. It also runs every 21 days from a 'safe' floppy set up during installation.

Installation

Like most software these days, installing Untouchable involves little more than typing INSTALL. This sets up three lines of defence. The first two simply add lines in AUTOEXEC.BAT and CONFIG.SYS (something, ironically, Untouchable does not approve of in other applications). These initiate UTRes and UTScan. It then performs a

memory scan to ensure that you have a clean machine.

Once it is satisfied that this is indeed the case, it proceeds with a further scan of your hard disk to build a signature for each file, to aid recovery should an unknown virus come along. The encrypted signature database is then saved to both hard disk and (along with the file scanner software) to a bootable floppy. Apart from some optional configuration (when should it run which of the tests, and which files should it look at?) that's all there is to it.

You really don't have to do anything to use Untouchable. UTRes and UTScan are run every

time you boot up, and the file modification scanner runs as often as you specify when setting up. Initially, this is set up to check only 'program' files, in which category it includes not only .bat, .com and .exe, but pif, drv, dll, ovl, sys and other potentially executable files. If there are any you think it has missed, you can add your own.

Standard viruses

The distribution problems associated with the dumb floppy-disk handling of DOS (see box) mean that getting hold of samples of viruses can be quite tricky. Some commercial software ships ready infected (our copy of the Distant Suns for Windows astronomy program, for example, carried the M. Angelo virus on the second disk — the one you are most likely to leave in after installation, and to boot from inadvertently). Magazine cover disks can be a good source, as can bulletin boards.

A few phone calls enabled me to build a reasonable collection: Stoned, Friday the 13th, Jerusalem, Brain and the aforementioned M. Angelo. I tested them in two ways. First I booted from an infected disk and let UTRes trawl memory for the virus, then I removed all traces of Untouchable from AUTOEXEC.BAT and CONFIG.SYS and let the virus infect the hard disk. The PC was then subjected to some fairly intensive file usage, at which point the Untouchable commands were reinstated and the machine rebooted.

The test viruses, though far from a comprehensive sample, were a fair selection of the more common examples and it was no real surprise that Untouchable caught them all.

The test viruses, though far from a comprehensive sample, were a fair selection of the more common examples and it was no real surprise that Untouchable caught them all.

The Gisborne virus

Writing a new virus is not a particularly tricky task but to test Untouchable, you don't actually need to. The package doesn't claim to detect a rogue TSR — only that it can detect the effects of the virus and recover from them. All you have to do, therefore, is to make your hard disk look infected, and that isn't hard. (True, there are stealthy viruses, where the program code is cleverly hidden, but such programs still need both a TSR and altered files in order to work and spread.)

The Gisborne virus is one of the most dangerous yet discovered. It will join files together, or modify them subtly, or tack whole new sections on the end. The potential is endless. I used XTree Gold's hex-file editor (it might just as easily have been Norton's or even Debug) to doctor files to simulate the presence of the Gisborne virus.

Having installed Untouchable and created a Safe Disk, I simply altered files on an old Dell 320. Just one at a time, by changing the copyright message.

Untouchable spotted that OK. What it wouldn't do was change it back. The file was, I was informed, unrecoverable. I told Untouchable to register the



memory scan to ensure that you have a clean machine.

Once it is satisfied that this is indeed the case, it proceeds with a further scan of your hard disk to build a signature for each file, to aid recovery should an unknown virus come along. The encrypted signature database is then saved to both hard disk and (along with the file scanner software) to a bootable floppy. Apart from some optional configuration (when should it run which of the tests, and which files should it look at?) that's all there is to it.

You really don't have to do anything to use Untouchable. UTRes and UTScan are run every

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Significant advances in the industry will be represented in specialist *Innovation Centres*, devoted to *Multimedia, Open Solutions, Objects, Networking* and *Innovations in OS/2* in association with IBM. Also for the first time, MacWorld Expo, the show for business and corporate Macintosh users, will be incorporated into The 1992 Which Computer? Show as a centre.

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Δ UT, the last-resort virus detection program, has no problem spotting the cunningly crafted Gisborne virus

changes, adding the signature of the modified file to its list. I then modified the first byte of the same file and ran a full check from the hard disk. The result was the same. Untouchable knew the file had been modified, but could not recover it.

Getting nasty

Then I got nasty. What if Untouchable didn't know the file had been modified at all? What if it simply knew that the last modified date DOS attaches to the file had changed? There was only one way to

check), Untouchable won't spot the changes.

That's not as dangerous as it sounds. For the data files to be corrupted, there would have to be a virus present. For a virus to be present and working, at least one .EXE or .COM file would have to have been added or modified and Untouchable will spot that.

The real test, though, was whether any other virus software would spot the differences Untouchable spotted. Having cleared the hard disk of 'infected' files and, indeed, of Untouchable, we repeated the process with Norton Anti-Virus, Central Point Anti-Virus, Microcom's Virex PC and Dr Solomon's Anti-Virus Toolkit.

The bad news, at least as far as Fifth Generation's claims for Untouchable are concerned, is that *all* these products will detect the various strains of the Gisborne virus. The only ray of hope is that Untouchable will recover files that none of the others could.

Conclusion

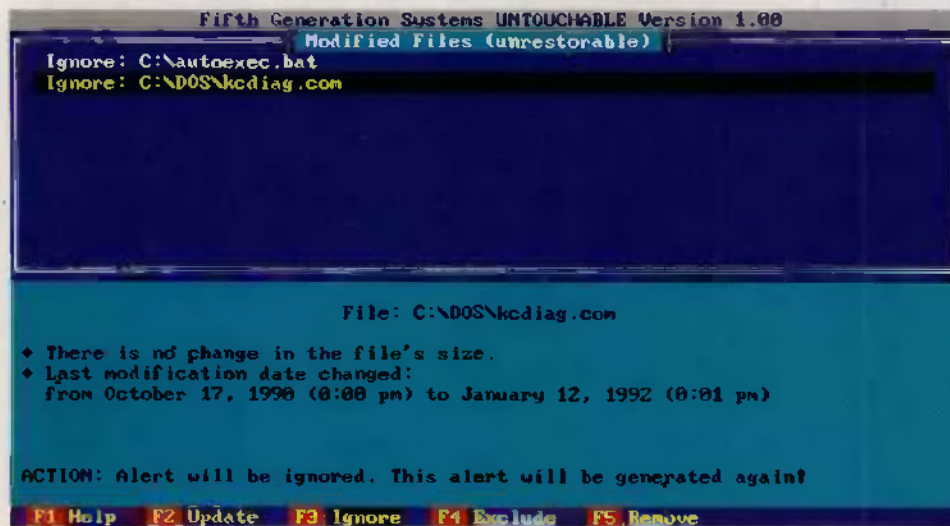
There is no doubt that Untouchable is a very good product. Much of the hype surrounding it is, in some way, justified. It is not as good as a first glance at the press release would have you believe. But, Fifth Generation doesn't actu-

ally claim as much as the hype implies.

File recovery, after infection, is limited but is as good as most other virus programs. The fact that it will recover some files that have been corrupted by some new viruses is a bonus.

If you want a one-shot vaccine that will protect your PC against DOS viruses for ever, without updates, Untouchable isn't it. It's rather like a spare tyre. When things go wrong, it will get you out of trouble but it won't stop you getting a puncture. If you want as near complete protection as it's possible to get, the quarterly 'known virus' updates are a must.

The combination of tried and tested and innovative detection methods certainly makes Untouchable worth a look. But it isn't the gem in a sea of rubbish the publishers would have you believe.



Δ As is so often the case with Untouchable, it spots a new virus' handywork but can do nothing about it

find out. I changed the first byte again, but used XTree to ensure that the last modified date was unchanged. Then I ran the full check again.

Untouchable, perhaps unsurprisingly, noted that the time had been modified, but not the date. Oddly, this time it offered to recover the file, which it did successfully. Now I modified the file and changed both the date and time to their original values. This, Untouchable decided, meant there was probably a virus at work. Did I want the file recovered? OK.

I filled the first 40 bytes with zeros. Again, this was spotted and recovered. Frustrated, I cut the file length from 30K to 1 byte. Untouchable spotted that, but it couldn't recover.

The most realistic test, of course, is not a file that has been altered or reduced to one byte, but the

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Euro Test Labs

PCW has joined forces with the best computer magazines in Europe to produce a set of benchmark tests exclusive to those journals. But this is not change for the sake of it: we aim to give you the ideal measure of system performance on a pan-European level.



In September 1991 we introduced version 4 of the PCW Benchmarks. We told you then that we thought they were the best in the business. We told you that our fundamental principles of solid low level and applications tests gave us a stable platform for years to come. We told you that we'd be adding Macin-

tosh, Unix and Windows benchmarks and, as time went by and hardware evolved, we'd be developing the benchmarks to suit. Now we're going to tell you we're scrapping them.

Why? Because we have been involved in a project to develop a suite of common benchmark tests for use exclusively by the best computer magazines in Europe. Only one magazine per country will be involved, but the tests and the results will be identical across the continent. *Chip* from Germany, *SVM* (*Science et Vie Micro*) from France, *Personal Computer Magazine* from Holland, *PC Magazine* from Italy, *PC Actual* from Spain and *Data News* from Belgium will be joining PCW among Europe's elite.

Those of you who agreed with the reasoning behind our original benchmarks — and the feedback we received at the time suggests that a lot of you did — will be pleased to hear that much of that philosophy is retained in the new benchmark suite. In fact, the similarities between our benchmarks and the new common suite, developed jointly by *Chip* and *SVM* to an agreed specification, are stun-

ning. Like our old tests, the Euro Test Labs benchmarks can be divided into applications and low-level benchmarks, but the similarities go deeper than that.

Low Level Tests

The disks are run with a standard setup, under DOS 5. There are no TSRs or device drivers loaded other than the DOS 5 high memory manager. The CONFIG.SYS file is as follows:

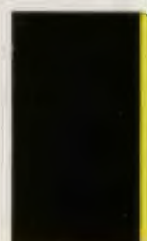
```
FILES=30
BUFFERS=20
DEVICE=HIMEM.SYS
```

There will be occasions where there is some special aspect of a PC's software setup which significantly affects its performance, favourably or otherwise. In such cases, we'll make sure you know about it.

The first two tests are exactly the same as the core of our old CPU tests, Dhrystone for integer maths and Whetstone for floating point. The table of results in Fig 1 on page 231 shows a sample set of results for a Dell 310 with 4Mb RAM and an 80Mb hard disk. As you can see, we have the option to display the results in a variety of ways.

The RAM tests are a little more sophisticated than the old PCW tests, largely because of the one major difference in philosophy. Whereas we felt, when we developed version 4 of our own benchmarks, that it was important to produce, as much as possible, platform independent tests, the whole European consortium, including PCW, agreed that it was important to test the hardware of each machine as thoroughly as possible.

To that end, the new RAM tests hit the hardware quite hard. As well as testing conventional memory,



the High Memory Area and Extended Memory are tested and the tests involve single and double byte moves and moves across double word boundaries.

The hard disk tests resort to PCW form, calculating a figure for access time and transfer rate. These figures will rarely coincide with manufacturer's claims, but they will closely correspond to the figures you are likely to achieve in real life.

The test determines the amount of disk space available, then, provided at least 33% is free, the difference between 33% and the available space is allocated for the test file (on an average 80Mb review machine hard disk these days, after the usual test software has been loaded, there will be at least 50Mb free, giving roughly a 24Mb test file). That file is written to and read from in an artificially but realistically fragmented space.

You'll get a feeling of déjà-vu when we tell you the spec for the video tests, too. Split into two parts, text and video, the former involves text writes and scrolls while the latter essentially involves line drawing, circle drawing, flood fills, and drawing and redrawing outline fonts on screen. There aren't many aspects of graphics performance that remain untested.

Applications Tests

As with the older tests, you'll find that the low level index is a more impressive figure than the applications one. The floating point performance forms only 2.5% of the overall index and 5% of the low level test. That skews the figures slightly, because very few applications actually use floating point (although, as you'll know if you do, when you need it, you need it badly).

What makes matters still worse is that the low level tests, although they operate in a real-world environment, aren't constrained by the compromises that are forced on applications writers. They are, in general, better at what they do than the equivalent routines in applications. Nonetheless, an application that does well in the low level tests, relative to its peers, will always do well in the applications tests.

New tests

The first two tests in this category will be new to you. The first is a DOS test which carries out a number of tests which, as they are under direct DOS control, follow *all* the rules. One hundred files are created, then copied and finally deleted. After the file tests are finished, a file is 'typed' to the screen and the scroll speed timed.

Next up is perhaps the most simple test of all, but one of the most illuminating. When we were developing version 4 of our own benchmarks, it was suggested to us that all we had to do was run a big source file through a decent compiler and time it. The compiler test does more or less that, and as you

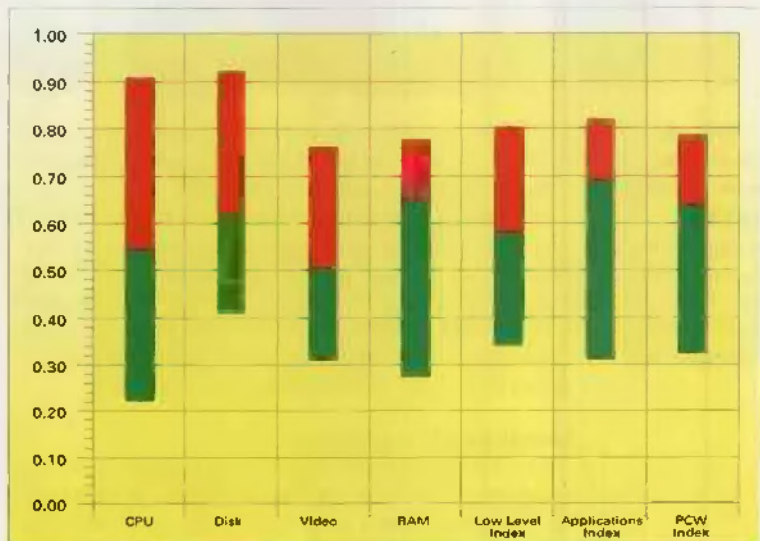
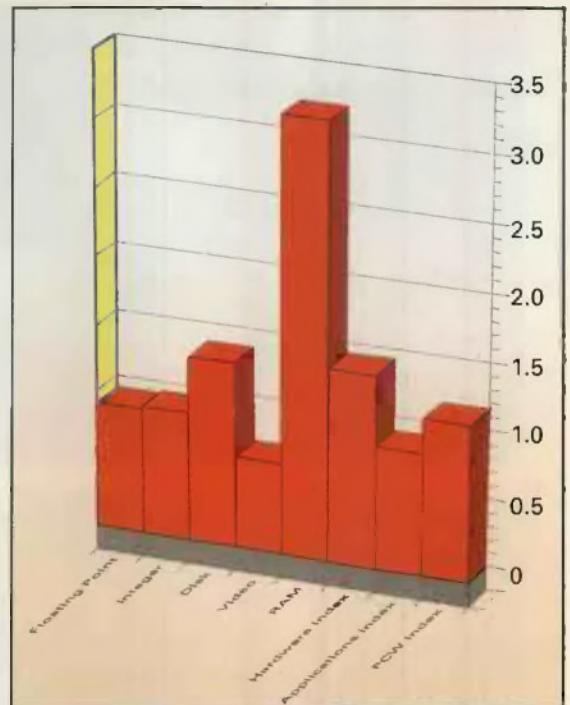
can see from Fig 1, the figure is fairly close to the overall index! The application is a fairly complex, modular Pascal program, run through Borland's Turbo Pascal.

The heart of our applications tests were a trio involving dBase, 1-2-3 and WordPerfect. Britain's favourite word processor, however, has patchy support in Europe and is replaced in the triumvirate with the DOS version of Word.

Again, the tests themselves are quite similar. The Word test is the most involved, testing just about every option in the benchmark's example of

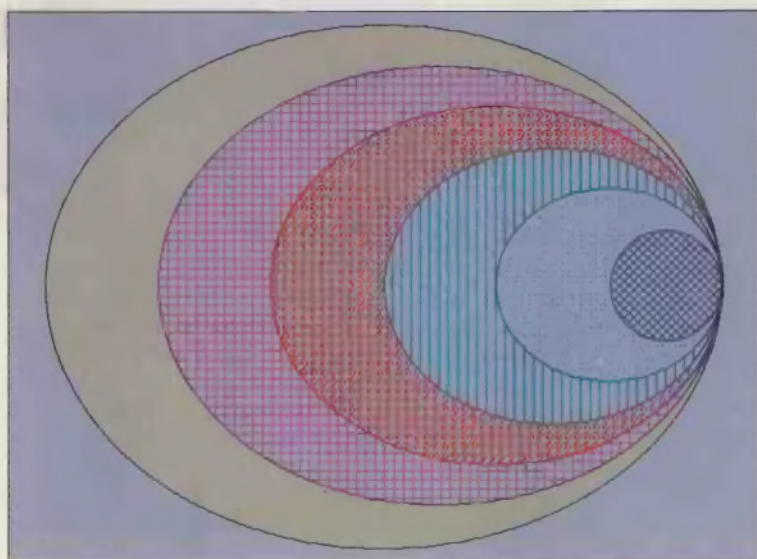
the most commonly used type of application. A document is read in, scrolled through from beginning to end and back using the cursor keys, and then again using Page Up and Page Down. The controlling macro then carries out a number of search and replace operations before altering the

△ Although the data has changed slightly, our graphs remain fundamentally the same▽



left and right margins and reformatting the document a number of times. A spell-check is the penultimate operation, carried out shortly before the document is reformatted again, this time into two columns and back.





△ The Low Level tests were produced by *Chip* magazine in Germany but are similar in concept to the old *PCW* tests

The 1-2-3 test performs a wide range of calculations, from simple sums and averages to floating point operations and chart drawing.

The dBase test hits the hard disk pretty hard. A file is duplicated, and another appended to it. A search and replace operation follows and the resulting file is indexed. Random fields are searched and printed to the screen. Records with a certain field value are deleted, and the whole file is packed. A numeric field is summed, then averaged.

Windows 3.0 application

The final applications test is a simple Windows 3.0 application written in Visual Basic. A Lissajous figure is drawn in a window, then a scroll and font changes are performed on a window full of text. Filled circles and squares in four windows simultaneously follow that, and a bitmap is loaded into a fifth window in the centre of the screen. Each of the five windows is then brought to the fore in a repetitive cycle.

Test Indices

The indices are calculated in a slightly different way to our previous tests. Before, we simply divided the score our reference machine achieved by the score for the machine on test to derive a relative score. The new tests are calculated in a similar way, but are weighted according to their importance in overall system performance.

The overall score for our new reference machine, a Compaq 486/33, is 10. That score is broken down as shown in Fig 1, where, for instance, floating point performance contributes just 2.5% to the overall score whereas hard disk and video performance account for 15% each.

Individual indices are calculated relative to the Compaq. A hard disk subsystem half as quick as the Compaq's will score 0.75 out of a possible 1.5.

Bear in mind, though, that the score is not out of a 'perfect' 10. There are already machines on the market which perform better than the index machine. The reason for choosing a 486/33 is to ensure a reference machine that will be, at worst, a mid-point figure in a year or two.

The grouped indices are the sum, rather than the average, of their component parts. The scores for the DOS, Compiler, dBase, 1-2-3, Word and Windows tests are added together to give an overall applications figure 'out of 5' — that is, half of the overall score.

Results

The tests may be the same all over Europe, but it was recognised at an early stage that there had to be enough flexibility to allow them to be adopted to suit the varying needs of the different titles and the different countries.

In Germany, for example, the scores will be given out of 10,000, for no other reason than to give a bigger number as an overall result. In France, a representation of a spherical space will be used to show the figures graphically.

Consistent format

The important thing is that, no matter what else they may do, all the participating magazines will display the overall index in the same format. If you come across a machine that scores 4.7 in Italy, the same machine will score 4.7 in *PCW*.

You won't only see these numbers in the seven Euro Test Labs member magazines, you'll also see them in manufacturers' advertisements. Advertisers will only be permitted to display the index numbers for PCs that have been tested in the Euro Test Labs, and the only numbers they will be permitted to display with our new logo will be the 'out of 10' score.

Graphs

We'll be displaying those scores alongside the Euro Test Labs logo in *PCW* benchtests from now on, but what else will we be doing with the new results? We're going to be doing just what we did with the old results. For individual machine tests, we'll be displaying a simple bar graph of the Low Level, Applications and Overall indices.

In Group Tests, we'll continue to use the high-low-close graphs in their current form. There will be bars representing each of the Low Level Test groups — CPU, Video, Disk and RAM (with the CPU results split between Integer and Floating Point on co-processor equipped PCs) — and an overall Low Level bar, an Applications bar and a bar representing the overall score.

As before, the bars will represent the lowest and highest scores in the group of products tested and, of course, the score for the machine to which the graph relates. Basically, green is good, red is bad. The bottom of the green section of the bar is the lowest score in the test, the top of the green section the machine on test, and the top of the red section is the best score of all. Think of it like a thermometer or a fuel gauge. An all-red bar is the worst possible, an all-green bar the best, and otherwise, the more green the better.

We've been struggling to find a sophisticated way to display the results of our *PCW* Price/Performance graphs. We tried 3D bar and area graphs in the magazine and everything we could think of in the office, from 3D surface plots to simple bar charts.

Philosophy

Given that the philosophy for all the other graphs was to make them readable but packed full of information, we really should have come up with the obvious solution earlier. We apologise for the delay. From now on you'll find four, separate bar graphs: one each for price, features and performance and one combining them all into a *PCW* Price/Performance Index. We know we've got it right this time, but we'd far rather admit we got it wrong and change it than pretend we always know best and leave you struggling to work out the old graphs.

We considered the implications of changing our

Overall Index (10 for Compaq 486/33)		4.622
CPU Index (1.25 for Compaq 486/33)		0.393
RAM Index (0.75 for Compaq 486/33)		0.292
Video Index (1.5 for Compaq 486/33)		0.740
Disk Index (1.5 for Compaq 486/33)		0.968
DOS Index (0.75 for Compaq 486/33)		0.411
Compiler Index (0.75 for Compaq 486/33)		0.412
Database Index (1 for Compaq 486/33)		0.646
Spreadsheet Index (0.75 for Compaq 486/33)		0.182
WP Index (0.75 for Compaq 486/33)		0.289
Windows Index (1 for Compaq 486/33)		0.289
Low Level Index (5 for Compaq 486/33)		2.393
Applications Index (5 for Compaq 486/33)		2.229
Dhrystones/second (1 for Compaq 486/33)	5540.0	0.343
KiloWhetstones/second (0.25 for Compaq 486/33)	54.4	0.05
RAM Tests (5*ram, 1*bios, 2*high, 2*ext) kb/sec (0.75 for Compaq 486/33)	4533.3	0.292
Text kb/sec (0.75 for Compaq 486/33)	1634.4	0.386
Graphics Operations/Second (0.75 for Compaq 486/33)	1040.6	0.354
Hard disk transfer rate kb/sec (0.75 for Compaq 486/33)	175.4	0.407
Hard disk access time (0.75 for Compaq 486/33)	20.0	0.561
DOS Test Seconds (0.75 for Compaq 486/33)	103.8	0.411
Compile Time Test Seconds (0.75 for Compaq 486/33)	114.1	0.412
Borland dBase Test Seconds (1 for Compaq 486/33)	179.6	0.646
Lotus 1-2-3 Test Seconds (0.75 for Compaq 486/33)	276.8	0.182
Microsoft Word Seconds (0.75 for Compaq 486/33)	157.6	0.289
Microsoft Windows Test Seconds (1 for Compaq 486/33)	115.3	0.289

Fig 1 Euro Test Labs Results for Dell 310

benchmarks so soon after their introduction. We know that a lot of you will have been expecting to be able to compare results over a longer period of time than six months. We think you're right. Now, however, you'll be able to compare results not just over time, but all over Europe.

And if you're worried that we had previously promised you a steady stream of new tests over the coming months, fear not. The plan is for more pan-European tests. The next to arrive will be a set of network tests developed by Holland's *Personal Computer Magazine* and, before the end of the year, a set of Windows benchmarks from *PCW*. Unix, Mac and software benchmarks are also planned.

No other magazine in Britain is as committed to Europe, or to its readers.







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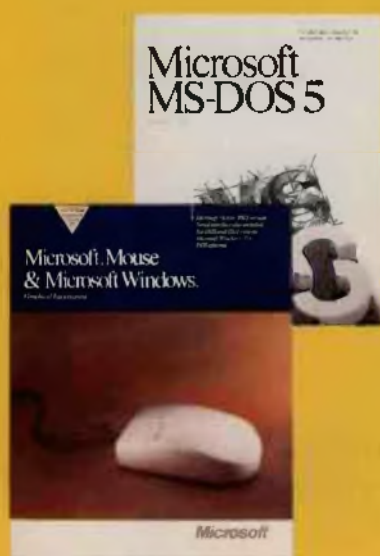
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USER MEMORY	2Mb	4Mb	4Mb	4Mb	4Mb
FLOPPY DISKS	1.2Mb & 1.4Mb	1.2Mb & 1.4Mb	1.2Mb & 1.4Mb	1.2Mb & 1.4Mb	1.2Mb & 1.4Mb
HARD DISK OPTIONS	51Mb: 105Mb: 210Mb	51Mb: 105Mb: 210Mb	51Mb: 105Mb: 210Mb	51Mb: 105Mb: 210Mb	51Mb: 105Mb: 210Mb
HD ACCESS TIME	9msec*	9msec*	9msec*	9msec*	9msec*
IO PORTS	2 x SERIAL, 1 x PRN	2 x SERIAL, 1 x PRN	2 x SERIAL, 1 x PRN	2 x SERIAL, 1 x PRN	2 x SERIAL, 1 x PRN
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Mitsubishi S3600-30 and PhotoScript card

Good colour printing remains far too costly for most of us, but this new printer and PostScript-processor board (with Mac and PC versions) is relatively affordable, if not cheap. The quality, while not photographic, is impressive, reports Guy Swarbrick.

The most RAM I'd ever had in a PC on my desk was 16Mb. More than enough for Windows, to be sure, and far more than I've been able to hold on to for any length of time. 8Mb is really good going. But with a PhotoScript card installed, my PC contained no less than 40Mb. Unfortunately, 32Mb of it was on the card, dedicated to the Mitsubishi S3600-30 colour printer, and was due to be sent back in less than a week. Ah well...

As PostScript gains even further ground in the page description language wars, the number of solutions that allow a non-PostScript printer to run Adobe's Reverse-Polish printer operating system seems to increase exponentially. Running a PostScript-compatible interpreter remotely from the printer isn't a new idea. Freedom of the Press has been doing exactly that in software for years and there are half a dozen hardware solutions that sell in respectable numbers.

Few boards, though, are as sophisticated or as specialised as Synergy's PhotoScript colour PostScript controller. Connected to any one of more

than a dozen non-PostScript colour printers, it can potentially turn a good product into a great one. We got an outfit put together by print-applications specialist Pisa Systems, based in High Wycombe, which in matching the board to the Mitsubishi produced the most exciting combination yet of dye sublimation printing technology (see below) and sensible pricing policies.

Installation

Those of you for whom manuals are a form of packing material, to be discarded as you frantically hunt among the foam chips for the product, will hate the PhotoScript card. The first thing you'll do is rip the case off your PC and stick the card in. More than likely, you'll leave the PC innards uncovered at this point, while you switch on and run the install program. But if you're the kind of oddball who is so confident of the ability of peripherals to work first time that you put the cover back on, and God forbid replace the half dozen or so screws, you're going to be very annoyed indeed. Because

Dye-sublimation printing

At the heart of both 'conventional' thermal transfer colour printers and the new breed of dye-sublimation or dye-diffusion printers is a roll of film coated in multi-coloured dye. However, a thermal transfer printer is 100% dot matrix and a dye-sublimation printer is anything but.

A thermal transfer printer, using a four-colour CMYK (Cyan, Magenta, Yellow and Black) film roll, can print only seven colours: cyan, magenta, yellow and black directly and red, green and blue by overprinting dots. If you count the paper colour, that's a grand total of eight colours. Dither

patterns (combinations of dots packed close together) are used to achieve the illusion of a wider colour range.

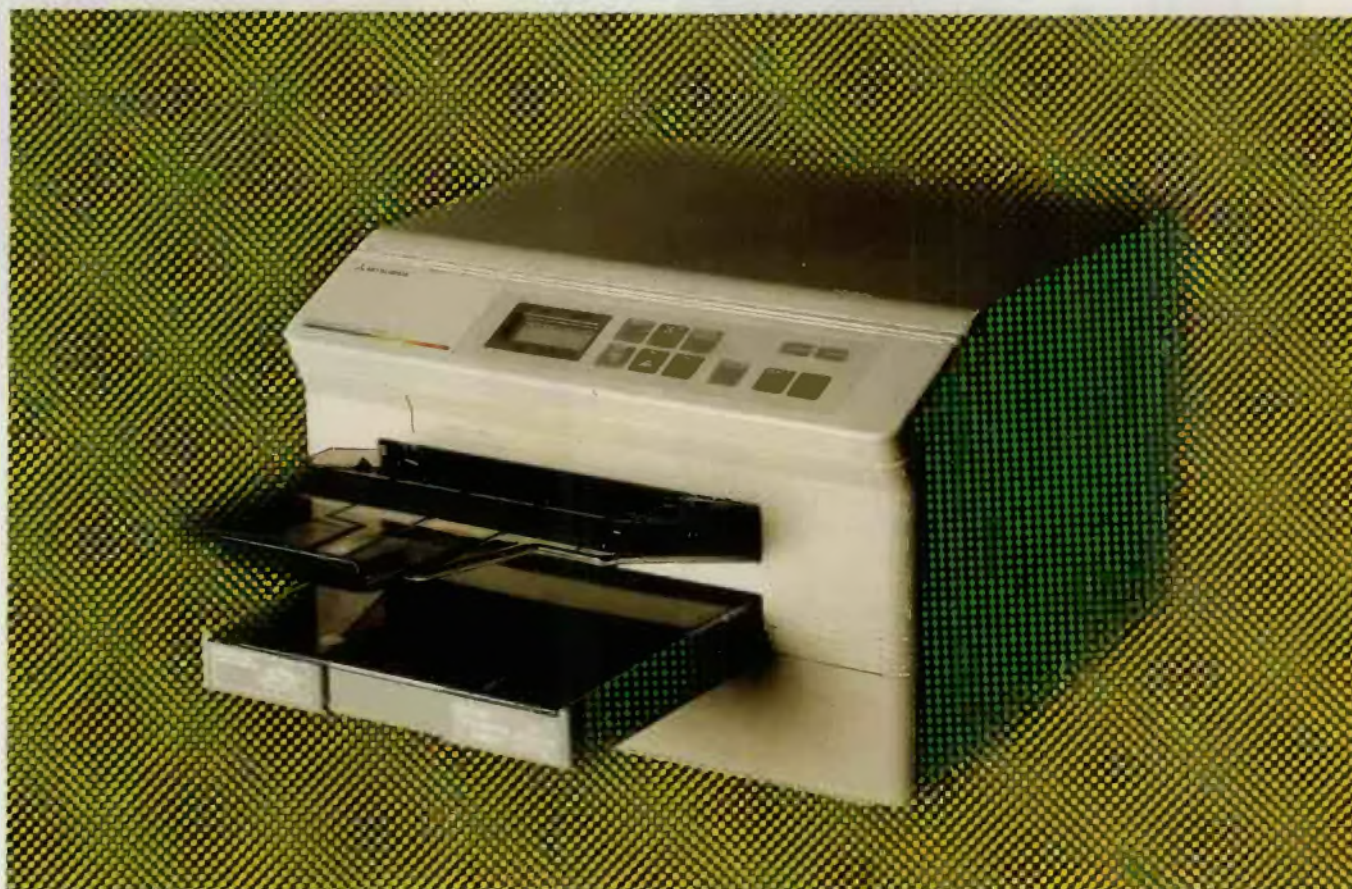
Dye sublimation printers don't need such tricks because unlike thermal printers they are not confined to a fixed-sized dot. The heat used to convert dye from solid to gas is varied to give 64 steps of ink intensity. Combine the three coloured films and you have a 24-bit palette — the ubiquitous 16.8 million colours.

The print head consists of a row of tiny resistors — 300 to the inch on the Mitsubishi S3600 — and the heat produced by each is proportional to the voltage applied, making dye

sublimation a process closely analogous to CRT imaging.

The result is a near photographic quality image without need of the halftones used in conventional process. It is claimed that a 300dpi printer is capable of producing images equal in quality to the conventional 2500-line halftone printing process used in magazine printing.

The comparisons with photography don't stop with the quality. The paper used in these printers is chemically treated and 'develops' the ink as it makes contact. The image is half on and half in the chemical layer on the paper surface.



you can't run the install program with the board in.

Having said that, installation takes only a couple of minutes, so the overall process is nowhere near as time consuming as, say, installing Microsoft Word for Windows, even if you put the card in first and rebuilt the case. You'll need the card to answer the questions the install program asks, and to set the switch settings it gives you. First choice is the processor. The on-board Weitek 8220 can be either a 16 or a 25MHz version and it's up to you to tell the software which you have.

PhotoScript then tells you which port the printer will hang off. The card behaves as though it were a Centronics port (or, as the Mitsubishi manual calls it, a Cenrtonics port) and will be configured as LPT2, unless you already have one.

Simple housekeeping next. PhotoScript needs to know where to put its files on your hard disk. It also asks you to name the drive from which those files are to be installed — an odd question, considering that you will almost certainly use the drive from which you ran the install program.

The next question isn't odd, though. Given the problems conflicting PC hardware and software can cause, choosing the correct port group for the card is crucial. If you happen to know all the ports currently used by your PC, you can choose one with some degree of confidence. If not, the only technique is to pick the first, and work through the list until everything works properly. The first option on the list (100-103) worked fine with my Dell 310, but the only other card present is a bog-standard VGA adapter. Expect problems in more complicated setups.

Next you must tell PhotoScript how much RAM you have. The memory is divided into three banks

of four SIMM sockets and you are asked whether 1Mb or 4Mb SIMMs fill each bank (the minimum configuration for the 300dpi Mitsubishi is 32Mb). Finally, you choose your printer and decide whether you want it installed each time you reboot, or on request via a specially created batch file.

Inadvisable option

The option of downloading PhotoScript to the printer on boot-up is not advisable, at least not at first. A message tells you it might take up to 10 seconds, but it took nearer 30 seconds on a 20MHz 386. The PhotoScript interpreter is kept on your hard disk and has to be downloaded from cold. That still might not seem a problem, but during the time I was trying to get the card and Windows to work together, 30 seconds every reboot quickly became intolerable. Given that you go through that process with most new bits of hardware and software, the batch file seems the most sensible long-term, as well as short-term, solution.

When you've finished with the options, the install program tells you how to set the two banks of DIP switches on the card. You plug it in and you're away. Or at least, you're away if you want to use humble DOS applications. To print from Windows apps you'll need to install the appropriate drivers. Other than the fact that you need a standard PostScript driver installed before you install the colour driver, there's no more to this than remembering the exact name of the printer.

To get a full A4 printout you have to use Special A4 paper, which is the same width but 3in longer than standard A4. This is because the Mitsubishi S3600-30 has a necessarily clumsy paper mechanism that grabs the paper at either end. You also

△ Despite the Weitek co-processor and 32Mb of RAM, the combination of PhotoScript card and Mitsubishi printer is anything but quick



△ Synergy's sophisticated PhotoScript controller

need to use a different printer driver called the A4S. There is no way to tell the drivers you are using Special or regular A4. No overt way, that is. In fact, they are set up so that selecting A4 really selects Special A4, and Letter is really regular A4. Like most kludges, it made sense to someone at the time.

And I had one more big problem. The printer simply hung if I powered up with the cable plugged in ready to go. It worked perfectly well if I plugged the cable in *after* power-up. Pisa said it was aware of this problem with the printer's interface card, and assured us that Britain's other S3600-30 didn't suffer from it.

PhotoScript

It's worth taking a look at the board before you plug it in. More than a third of it is taken up with those SIMM sockets — and this is an 8-bit card. The fact that most traditional PC cards have relied on the PC's processor and memory has meant that we've got used to complex cards being 16-bit (or even 32-bit EISA). With the processor and RAM on board, of course, all the PhotoScript card needs is power and simple communication with the motherboard. And

impressive piece of hardware. A couple of years later I got to play with a more modern thermal transfer printer, the first dye sublimation printer I'd used.

Physically, the S3600-30 looks much like any other colour printer — enormous. There's a large, square LCD on the front panel and a handful of control buttons. You can accomplish sophisticated tasks like altering colour balance through this unsophisticated user interface, but I had little cause to use the buttons other than the Online one (the printer occasionally went offline between jobs).

Opening the top of the case is easy enough and reveals the two spools around which, in varying quantities, is wrapped the film bearing panels of ink (more accurately, dye). Unlike earlier thermal transfer and dye sublimation printers, the film is semi-enclosed in a plastic cartridge. Although this helps routine maintenance, during the lifetime of a roll of film, the roll has to be loaded into the cartridge manually. The number of pages per roll depends on whether it is a three-colour or four-colour roll, or rather perversely a monochrome roll: you need different rolls depending on whether you are printing on paper or transparencies.

Above the cartridge is the thermal printhead and its three multi-bladed cooling fans. If you are unsure why the printer is so noisy before you open it, you are in no doubt afterwards.

The paper path is relatively simple, but clearing paper jams can be a pain as the fragile and static-clingy film has to be removed. Fortunately, the weight of the paper and the simplicity of its travel arrangements keep jams to a minimum.

In use

When the combination of card, printer, Windows drivers and Windows application works properly, the results are absolutely astounding. You know they're going to be as soon as you see the colour chart the self-test produces (see Fig 1), but you realise just what you have sitting on your desk only when you see something you've seen on screen appear on a sheet of that oh-so-expensive paper. (Pisa reckons the running costs will come down to around £2 per page. If so, this one of the cheapest dye sublimation printers yet. The best until now was nearer £3 a sheet.)

The results are not photographic quality and you shouldn't believe any advertising literature that says they are. They are, however, very, very good. In fact, I've seen some cheaply produced magazines



△ For a colour printer with a halfway sensible price tag, colour rendition is superb

that's all it has, with only 27 of the available 62 connections made through the edge connector.

After the SIMM sockets, there are four EPROMs labelled SY-RPH V1.05 A to D, then the Weitek co-processor and a handful of logic chips that form the bulk of the parallel controller. This is not the neatest board I've seen. A patch wire and a resistor soldered across the pins of one of the ICs would have been a reasonable error count on a revision 1.0 board, but the fact that one of the TTL chips is four pins too long for the space allowed on the board is little short of astonishing.

Mitsubishi S3600-30

I'm getting quite used to Mitsubishi's colour printers. The first one I tested only ran on a Mac and could only print screendumps, yet it was a very



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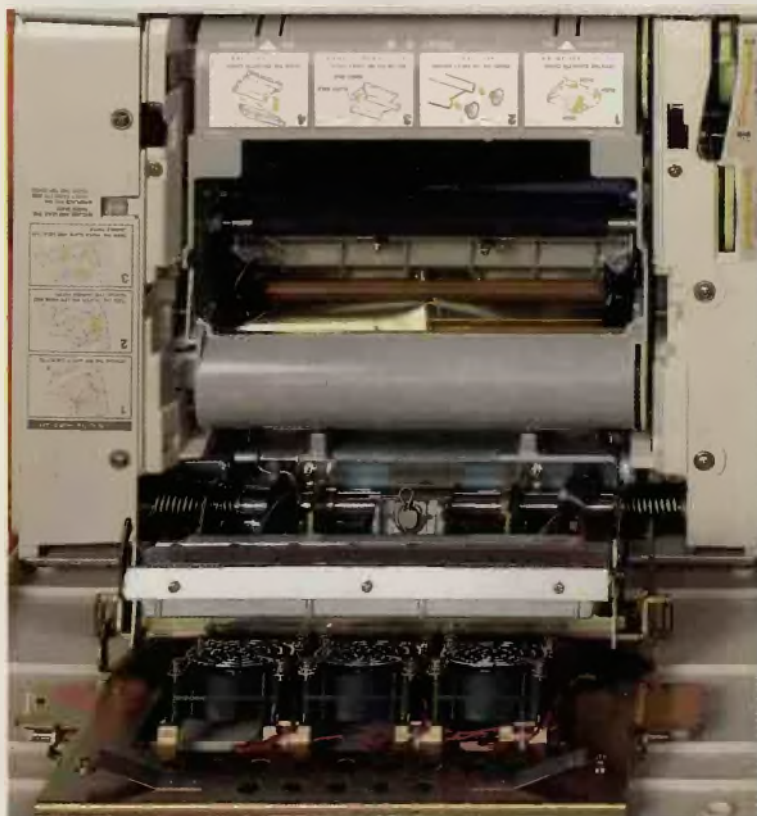


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PCW92



▲ The three fans in the lid keep the insides of the S3600-30 within a reasonable temperature range

with colour reproduction that the S3600-30 comfortably outclasses.

There is little point in trying to describe how good colour prints look: it's far easier for you to see for yourself. I picked a simple line drawing from Corel, a complex fountain fill and a bitmap, to give you an idea of the S3600's ability. You may notice something odd about the bitmap, especially if you've seen it before. Yes, the sand should be, well, sand coloured. It isn't, because from time to time, the combination of S3600, Corel and the Windows drivers refused to print anything from the yellow dye film.

I suspect that the problem is down to the Windows drivers rather than Corel Draw, even though the symptom didn't appear in any other combination of drivers and software. Corel, though, is a strong runner-up on my list of possible suspects.

The problem could often be eliminated by resizing an object, which seems to suggest Corel is at fault. But I've used Corel with other colour printers, and while I've had problems, I've never had anything remotely like this.

What more can I say? The printer drivers mean that the printer works with all Windows applications. The print engine is capable of colour rendition that ranges from bold and bright to subtle and smooth; even solid black with a three-colour CMY film is impressive. A minor problem is that prints take between four and 20 minutes (it's still much quicker than sending the file to a bureau) and a major one is that the drivers appear to be very broken at present.

Documentation for the PhotoScript card is minimal but adequate. It covers installation in great detail, but skips over issues like whether or not PhotoScript is a PostScript product or a PostScript compatible product. (The documentation uses both

terms, but Pisa says it is 'not an Adobe product'.) Nor does the manual explain why, if the interpreter is in software to allow you to upgrade to the latest version of PostScript more easily, we were supplied with PostScript Level One with Color Extensions, rather than full-blown, colour-printer friendly Level Two.

Prices

Did I say the drivers were the only major problem? What I meant to say was that the drivers and the price were the only major problems. Sit down: the printer will set you back £10,999. The board, with 32Mb of RAM to run the 300dpi S3600, will set you back £2850 (see 'Specifications' box below for other configurations).

If that isn't enough, the current price of a three-colour film roll (100 prints) is £148 and a pack of 100 sheets of Special A4 paper a further £140. Painful, isn't it?

But these prices are for Japanese-made consumables. As we went to press Mitsubishi was due to announce a new UK source which would significantly reduce running costs.

Conclusion

You aren't going to get photographic-quality prints out of the S3600, no matter how much work is done on the drivers. You may well get print quality so good that, for certain types of work at least, the difference is negligible.

The problem with the printer interface on the review model was disturbing. Pisa says it was a one-off but even a single failure can hardly be considered healthy. The state of the Windows drivers is more worrying. Some of the problems were no doubt down to Corel Draw, but the tendency to occasionally not print from the yellow film is a serious flaw.

Colour printing is still nowhere near cheap enough to be a sensible option for everybody, but the combination of PhotoScript and the S3600-30 dramatically increases the number of people for whom high-quality colour printing is a possibility.

Specifications

Mitsubishi S3600-30

PhotoScript card

Supplier

Pisa (0240) 244455

Printer resolution

300dpi

Board processor

Weitek 8220

Platforms

PhotoScript versions available for Mac or PC.

In-printer models customised on request

Prices

Printer: £10,999 ex VAT

PhotoScript:

8Mb £2195

12Mb £2355

16Mb £2450

32Mb £2850

(Pisa says the 8Mb version is suitable for any A4 thermal-wax printer, and the 12Mb for A3 thermal-wax or 150dpi dye sublimation printers.)

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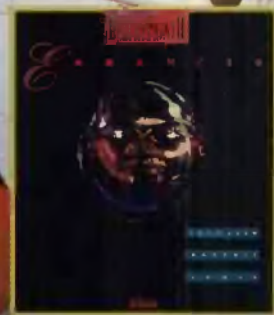
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Computers in the woodwork

GUI pioneer Xerox PARC is testing 3D data spaces that could dictate future screen design. Aiming still further ahead is the 'ubiquitous computing' project, a bid to mesh 'real' and 'cyber' space — and more worrying, literally to keep tabs on people. Nick Hampshire reports.

Xerox Corporation's Palo Alto Research Center, better known as PARC, is legendary for developing new computing technologies. It has been at the forefront of the development of artificial intelligence and object-oriented programming. But its most famous innovation was the 'windows' graphical user interface with its mouse pointer and icons, which became familiar to all of us when Apple adopted it for the Mac. Of course, it is now widely used on PCs and workstations in products such as Windows 3.0.

It is hardly surprising, then, that the centre is watched keenly for clues as to future trends. With this in mind, I visited there recently in search of the latest ideas.

Palo Alto is a small town at one end of San Francisco Bay. To get there you drive south, away from the attractive old houses of San Francisco and the view across the bay towards mist-veiled Alcatraz and the Golden Gate bridge. Along the main highway to San Jose, past the airport and into a land of billboards, concrete flyovers and sprawling low-level factories hidden behind curtains of oleander bushes; into an indistinguishable urban sprawl that extends beneath the smog up the valley between the Santa Cruz and Diablo mountains and south to San Jose and beyond.

Pool of talent

This area is better known to most of us as Silicon Valley, and it still has probably the world's highest concentration of engineering talent, a pool of talent fed by the great universities of Stanford and Berkeley, as well as countless other academic institutions around the world. A pool from which PARC has drawn some of the brightest.

Xerox Corporation is of course best known for its photocopier and document-handling systems. So is its UK associate and largest shareholder Rank Xerox, which has a sister research centre called

EuroPARC at Cambridge, another hotspot of engineering talent. Predictably, the main thrust of research at both PARC and EuroPARC is directed at developing systems to facilitate the handling of documents and information. The user interface with the computer system storing the information is all important: getting a computer to store information is relatively easy; enabling someone to use that stored information creatively is much harder. The GUI was one of the first steps in this quest.

Search and study

The search for better ways of using, storing and retrieving information is an entirely different process to, say, the development of faster processors or bigger memories. It involves a very deep study of human as well as technological factors. This makes both PARC and EuroPARC different in two respects. Firstly, their researchers include psychologists, economists, mathematicians, and even philosophers, as well as computer scientists and engineers. Secondly, they tend to use technologies which are already practical and so researchers can build actual systems and test them in real working environments.

So the two PARCs are testbeds for near-future systems. They try out and refine system ideas which we all may be using towards the end of the decade. Every day they use devices and systems completely unfamiliar to the rest of the world.

Here, I shall be looking at two of these experimental systems. The first is a 'desktop' system which could well become a successor to the current 'windows' generation. Developers call it the 'Information Visualiser'. The second is a system of closely interconnected hardware components, designed to overcome many of the limitations imposed by the size, and fixed location, of a conventional computer display. It includes such novelties as intelligent ID badges, stylus-operated workpads, wall-sized



Liveboards, and a concept, for the more distant future, involving hundreds of computers in a single room and known as 'ubiquitous computing'.

The Information Visualiser

A GUI like Windows 3.0 is an enormous advance in usability over the simple DOS or Unix prompt, enabling the average user to use computer systems at a level that would have been impossible with a prompt-based system. A Windows-type system can be learned quickly by virtually anyone: it is less intimidating, and it does not involve the user learning complex command syntax. Furthermore, it offers a uniform interface for a whole range of different applications. It can also easily provide the basis for more complex systems, such as networks, multi-tasking, and distributed processing systems.

There can be little doubt that its invention by PARC scientists well over a decade ago revolutionised the way PCs are used. Nevertheless, this type of user interface has drawbacks, some of which are already imposing limitations on new applications. One of the most noticeable is the fact that the system is confined by the physical limitations of the screen. You may want half a dozen windows open but it is impossible to view them all. The user has either to stack them up or reduce them to icon size, neither of which is entirely satisfactory. Also, Windows is primarily a general applications interface: it is a program-command handling system rather than an information handling system.

With the increasing importance and volume of information being handled by users, PARC researchers, as part of what is called the Interactive Information Access Project, have further developed the windows concept to enhance information handling. The outcome has been a system which its

creators, Stuart Card, George Robertson, and Jock Mackinlay, have called the Information Visualiser. This too is a graphics-based user interface using a mouse as the primary pointing and input device. But the similarity ends there, because the Information Visualiser is a three-dimensional full-colour system relying heavily on real time and interactive animation.

The 3D images used are designed to draw the user into an artificial reality — something which the system achieves quite remarkably, not by the use of virtual-imaging techniques such as 3D goggles and data gloves, but by using perceptual depth cues such as shading and perspective. The 3D artificial world consists of a collection of rooms which contain interactive objects that represent information structures.

You can examine and use the information contained in these structures by literally 'walking' through it, as if you were playing a computer game. The process is aided by the use of virtual joysticks. The information is in fact stored in an experimental database designed by PARC's System Science Laboratory's Natural Language Theory and Technology Group. Called Text Database, this very fast and powerful system handles all storage, retrieval, and indexing.

Cluster muster

The storage of information by the Information Visualiser system is based on two ideas. The first of these is the discovery by PARC researchers that users tend to create clusters of windows related to a specific task. When moving from task to task, users jump from cluster to cluster, with the constituents of each cluster remaining remarkably constant over a long period. The second idea is to assess

△ Xerox' Palo Alto Research Center in California. The future of computing is being planned here now

the 'cost' of information storage, not in terms of money but in terms of the speed and ease with which the user can access information. Thus information stored on a network server is regarded as more 'expensive' than that stored in system RAM. The 'cheapest' information is that which the user can see directly on the screen.

Which all argues for a system that structures information into logical clusters and displays as much information as possible on screen. Hence the concept of a 3D 'building' in which each room is a virtual workspace containing a task-oriented information cluster. Within each room you can have a number of windows, as well as objects relevant to the common task. 'Doors' allow easy movement between rooms.

The aim is to encapsulate an information cluster to eliminate the usual clutter of windows screens. It also allows the system to reduce the 'cost' of information by anticipating requirements and moving them to less costly storage areas — from file server to hard disk, or from hard disk to RAM.

You move through a room's 3D space by means of a set of navigation and manipulation routines. These are based upon a conventional mouse, and allow the 2D mouse movement to be translated into movement in six degrees of freedom. You are in effect given a virtual body, which means that what you see on screen is the view from your current location within the room. You have all the visual feel of moving around a proper room, except that you move by using the mouse to 'manipulate' a virtual joystick. This is associated with an icon in the centre of the screen: to move forward, you simply push the mouse forward; to move left, you push it left, and so on.

Other virtual joysticks allow you to rotate your body or change your viewpoint. Also, a whole

cues change as you move towards an object. An interesting feature here is that your approach is not at an even rate: the closer you get, the slower you advance. This prevents you colliding with an object. Of course, the reverse also happens: you speed up as you move away.

When your virtual body is close to an object, you can select it, pick it up, move it, or bring it to the centre of your field of view for closer examination. You can even put the object, or a copy, into a virtual pocket and take it with you to another room — important because the system allows you to have the same objects in different rooms. Changing an object results in the same changes being made automatically to all copies.

Moving from room to room (in other words, moving from task to task) is as simple as moving around an individual room. One route is via the doors that connect each room to its neighbours — you just walk through the appropriate one. A door in the back of each room allows you to return to the room you came from.

Alternatively, you can jump to a specific room by naming it, or by selecting it from an Overview screen showing reduced-scale versions of rooms and their contents. You can also use this Overview to display interconnection diagrams showing the relationship between rooms and objects.

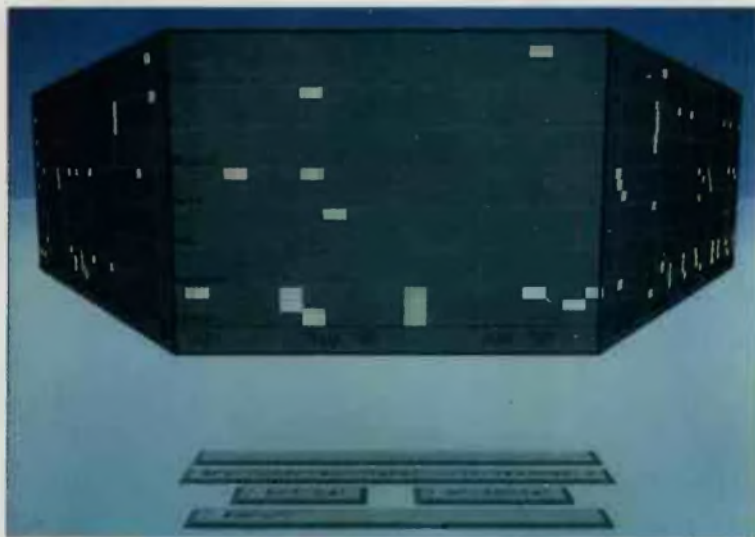
More visualisations

The 3D graphics objects in these rooms allow users to see information in a much broader context than would be possible with a conventional record-card approach to database interrogation. It is for this reason that PARC has coined the term 'visualisations'.

PARC's Text Database groups information into three classes: unstructured, linear, and hierarchical. The visualisation of unstructured information very much depends upon the nature of the information and the application. You could, for example, identify a set of people working along similar lines by having a visualisation which graphically linked a class of information accessed from a library with the researchers accessing it. Or you could show the relationship between a group of people, the information produced by them, and time. Indeed, the number of ways to present a broad graphical visualisation of relatively unstructured information is virtually infinite.

The most common linear information structure is that presenting a relationship to time. This could range from a simple diary system to some sort of project management database. The problem with using a standard time chart, especially one covering a long period, is that only a small section can fit on screen at a time. To get the whole picture you either have to condense the scale, and thus lose detail, or print the whole thing out.

The Information Visualiser overcomes these problems by presenting linear data as a panelled 'Perspective Wall' (see Fig 1). A central panel on this implied 3D object displays a detailed time frame. On either side, the wall bends backwards towards the past and future, decreasing in detail with distance. The idea is that you can simultaneously look at the detail and get an overall view. You can slide the view along the wall, panel by panel, to



△ The Information Visualiser presents linear data as a panelled 'Perspective Wall'

range of different functions is activated by subtle movements of the mouse with a button held down. These movements, called gestures, are a powerful new mouse-based input technique.

Virtual pockets

Your distance from objects in a room can be gauged from perceptual depth cues, in particular perspective sizing and the use of light and shadow. These

change the focus frame.

This is extremely useful in itself, but the Information Visualiser goes even further. You can, for example, track specific objects on the chart as they move into the distance. You can also magnify the central panel in order to eliminate any clutter and thus look more closely at it.

The Information Visualiser really comes into its own with hierarchical information structures. These are both complex and common — examples are disk directories, company management structures, or an evolutionary tree. Two basic visualisations are employed: a Cone Tree, which is a 3D version of the familiar tree graph; and a Cam Tree, in which the hierarchy proceeds from left to right, rather than top to bottom. The virtue of the Cam Tree is simply that a horizontal text label is easier to read than a vertical one, so that a tree can embody a greater information density. Both Cam and Cone use depth cues: objects cast shadows, and closer objects are larger than distant ones.

Both these structures can display an enormous amount of information in a single room: hierarchies with 1000 accessible nodes are no problem. Select a node, and the tree rotates until a direct path is visible between the node and the root. This path is displayed either horizontally or vertically across the centre front of the screen. This rotation process can take place smoothly and automatically even when there are as many as a dozen hierarchy levels. Watching it happen is fascinating and can provide further insight into information relationships.

Information Visualiser provides a range of different tools for manipulating and searching these 3D trees. Manipulation is usually achieved by a mouse gesture: a 'left flick' will prune all branches below a selected node, and a 'right flick' will grow them back again.

Of course, you can simply browse through nodes, but a system search of an entire tree can be interesting and informative because it is performed visually and you can interact with the process. All nodes disappear when a search is initiated, and on being searched they reappear with a red underline, the length of which indicates the degree of match.

It is often possible to curtail the search without going through the entire tree, when a particular branch is obviously registering a high match rate. One advantage is that you can identify widely separated branches sharing similar data. This can speed up the search process, though the search algorithms are very fast and work as a background task allowing you to do other things.

Goodbye hourglasses

The elimination of those annoying waits for some process to be completed is one of the prime features of the Information Visualiser. There is none of those annoying little hourglasses. The system will even compensate for varying processing loads: actions in particular animations appear to be performed at the same speed even with a large number of background tasks.

Many of these background tasks are the result of the extensive use of multiple 'asynchronous agents'. These are created by the so-called 'Cognitive Co-processor' and allow a tight coupling between the user and an application via the Information Visual-



iser system. A search routine, for example, is embodied as an agent and performed as a background task. Even the user's interaction with the system is governed by agents, all of which makes for smooth operation.

Power rise, price drop

The Information Visualiser needs enormous computing power. All the development work has been done on a Unix-based Silicon Graphics Iris, but as the people at PARC point out, personal computing power is rising rapidly and prices are dropping equally rapidly. If this trend continues at the current rate, there is no reason why most of us will not be able to run Information Visualiser on our systems in about three to four years' time.

Meanwhile, I would not be surprised if some of the concepts did not surface in applications. It is, for example, a highly object-oriented system and many of the object manipulation and display techniques could be utilised by most other OO-based applications. Conversely, of course, Information Visualiser would be the ideal user interface to OOP and artificial intelligence systems, including intelligent agents and other similar devices. Indeed, Information Visualiser or its successors will probably be used first by people running such applications on powerful workstation systems.

The Information Visualiser software is an attempt to overcome the physical limitations of a conventional display terminal. After all, only the most expensive systems have screen resolutions much greater than 1000 x 1000 dots, about the same number as on a 3in square of laser printing. Of course, an extensive colour palette does allow more information to be conveyed, a factor used by Information Visualiser.

Display technology has limitations. We may be able to push mass produced, reasonably priced, colour CRT technology to 2000 dots square, but eventually we hit the limits imposed by the creation of a glass envelope. Similarly, LCD and other flat-screen technologies have limitations on the number of colours, maximum screen size and resolution which look unlikely to be overcome within the next decade.

One solution, which has been tried, is to tile a number of screens to create a much larger one. The

△ The Cam Tree visualisation, in which the hierarchy proceeds from left to right, rather than top to bottom

trouble is that you can always see the joins, particularly when tiling colour CRT tubes. Furthermore, such tiled systems are extremely expensive.

Ubiquitous computing

Researchers at PARC have put an enormous effort over the past few years into overcoming these problems. At the same time they have sought to develop systems which will provide an even better user interaction than that offered by any existing systems, even including Information Visualiser. In so doing they have steered away from fashionable ideas about multimedia and virtual reality, and gone to the almost opposite extreme of making computing a seamless extension of our everyday lives. In the process they threaten to banish the very concept of personal computing and replace it with what they refer to as 'ubiquitous computing'.

The underlying idea, based on well-founded research into human psychology, is that we can be fully creative only when we no longer have to think about the necessary tools. We happily use pen and paper because we are familiar with them. However, if we were asked to write something in an unfamiliar foreign script, say Chinese, we would have to think about pen movements and thus find it very hard. Similarly, looking up information in a library is easy if we are familiar with the cataloguing and indexing system.

The same applies to personal computers. We can only maximise their creative use when we no longer have to think about the system we are using, when we no longer have to consciously remember commands but can operate it at a subconscious level.

What this implied to researchers at PARC was that they needed to make computers as accessible and easy to use as a pen and paper. With the creation of such a system, the actual computing

In order to achieve this goal they looked at how people work: how they look up information, make notes, interact with other people, move around. From such observations it was clear that a conventional workstation, even when fully networked, can be limiting. People using books and magazines for reference will have several open upon their desk at pages of interest, and can visually scan from one to another with ease. But a computer user has to open, close, or move information windows, or scroll up or down through a window. There is thus little or no possibility of scanning several documents at once. And when you are in someone else's office, getting information from your own remote computer is an involved process even with a good network. We need to get away from the static workstation approach and produce systems which anticipate our needs; systems which know that we are in another office and have already made the direct link to our desk.

Networks are at the heart of PARC's ideas on all this. Most important is the need to avoid the use of plugs and cables. The PARC network, in addition to traditional cable links, uses wireless links based on cellular-phone technology. They will transfer up to about 10Mbits per second over a range of about 100 metres. Transceiver units are mounted on the ceiling of each room, with miniaturised versions in every computer. These transceivers are linked to a gigabit-per-second network which directly connects a number of file servers, workstations and printers. Infra-red links of much lower power, similar to those in TV remote controllers, are used to connect very small (6x6x1cm) portable computers known as 'tabs'.

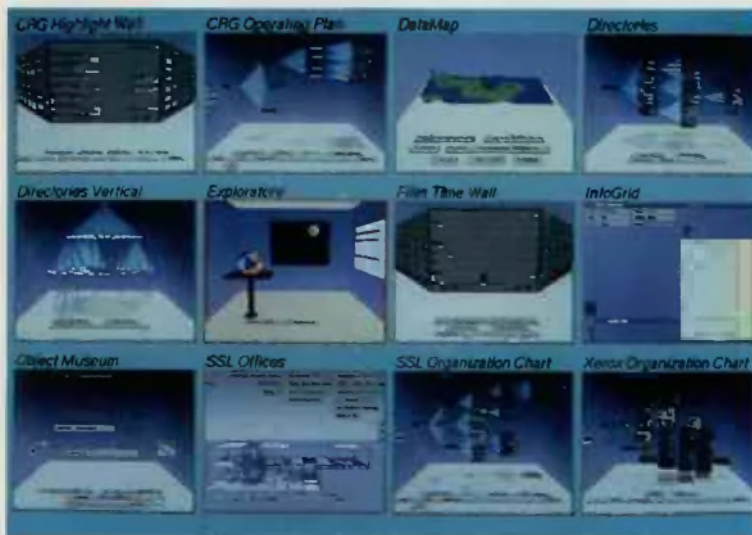
Keeping tabs

One use for tabs, with their built-in IR transceivers, is as an ID badge. Such badges are an important component of the ubiquitous computing concept and they have already been produced at Olivetti's Cambridge research labs (see *PCW*, February). An intelligent ID badge linked to a site-wide network can accurately locate individuals within the site.

Obviously this has major security benefits, but it also allows the network to anticipate your requirements. It can automatically route telephone calls to the phone nearest to you, or it can ensure that your nearest terminal is set to run the program or access the data you last used in your own office. It can tailor any terminal to your preferences: we all know how frustrating it can be using someone else's system and finding an unfamiliar setup and our favourite word processor unavailable.

A variation of the basic tab would be one which also contains a small display, somewhat like a pager, to provide basic interaction between the person carrying it and the network. The tab can provide notification of scheduled meetings or other events. Such active tabs could also be used as a means of moving personal information — that is, information not stored on the network — between one system and another. In this mode, a tab functions as a portable icon: to transfer information you simply shrink it down to an icon and post it to the tab; the reverse applies when retrieving it. You can interact with all tabs in this manner.

Tabs can also be used to keep track of things.



△ Selection of Information Visualiser screens showing uses of implied 3D visual cues

component will become invisible, integrating seamlessly into everyone's lives. Gone will be any need for computer literacy. Instead of forcing the human to fit the machine environment with all its frustrating and stressful consequences, the machine will be made to fit the human environment. Only then will computing, according to the people at PARC, become truly personal.



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There is no reason why a document or a book should not have a tab attached to it. You could even locate a lost book or document by having a beeper in the tab. PARC envisages a situation where there might be hundreds of tabs in each room, all with different functions. The room thermostat could be a tab, the wall clock a tab, tabs could even be used as Post-It notes. They could be used to activate and personalise information sources, such as notice boards. Instead of having pieces of paper pinned on a board, the messages could be displayed on a large LCD screen, the messages displayed being selected by the viewer via his or her tab ID.

Pads

The next step up from the tab is the 'pad', seen as the equivalent of a pencil and notepad. Each pad is about A4 size, 3cm thick, with a large monochrome 1024 x 768 LCD. Inside each pad are a couple of microprocessors, 4Mb of RAM, batteries, and a high-speed radio network link. There is no keyboard, just a high-resolution pen interface with appropriate handwriting recognition software.

Because they are small and light, pads can be picked up and moved around with ease. They can be put on a table, held in one hand, propped upon your lap, and used anywhere. PARC people expect pad weight and thickness to be reduced enormously in the next few years, while resolution, memory size and processor power will all increase.

Pads may look superficially like a conventional notebook

computer. They even run a Windows-type operating environment. However, they are designed to be used not as computers in the familiar sense but as paper pads or reference books: you could have half a dozen on your desk. One could be used for writing notes, others could contain reference data obtained from the network, another one could monitor e-mail messages. The concept thus overcomes the limitations of screen size: each pad can be used just like a window, but with the advantage of being able to look at several at the same time, in exactly the same way that one might use a number of books or documents.

Boards

Next size up is a large display, or 'board' as it is called by PARC. Prototype boards measure about 100 x 150cm with a 1024 x 768 resolution. They are the equivalent of a chalk or whiteboard, a flip chart, or even a notice board. Like the pad they feature a pen or 'chalk' input device and are linked to the network by radio. PARC expects to increase board resolution considerably, and displays with more than 10 million pixels are not considered an impossibility by the end of the decade.

The biggest problem has not been the creation of

the ubiquitous computing hardware, but in integrating it into a seamless entity that anyone can use. The researchers are well aware that the real power of the system arises from the interaction of its various components. They constitute a complete environment, not just a number of man/machine interfaces.

There is a major problem concerning the design of a suitable operating system. Current computer and network operating systems assume that the system configuration is constant, but a ubiquitous system OS has to cope with the fact that the number and location of active tabs, pads, and boards is continually changing.

The solution, according to PARC researchers, is to use an infinitely flexible OS based on a microkernel providing a basic set of functions in each hardware unit. This automatically meshes into the network OS, which thus can grow or shrink in response to how many units are present.

PARC is also investigating how ubiquitous computer systems are actually used. For example, the fact that boards can be shared by people in different places gives rise to a different user-interaction to that of a network or video conference system. Researchers are looking at all the different ways in which ubiquitous devices can be used — ways, to use their phraseology, in which to 'push the interface into the woodwork'.

Conclusion

I have looked at just two research projects being conducted by Xerox PARC. There are many more, such as the Activity Based Information Retrieval programme, or work on multimedia systems. All are exciting developments, but I found the two areas which I have covered, in particular ubiquitous computing, particularly interesting.

Radio and TV are now ubiquitous technologies, and sooner or later computing will join them. When that happens our 'interface' with the information world will be dispersed throughout our physical environment, shaped and responsive to our needs, integrating all the different methods of communicating information. PARC calls this 'environmental computing'. The great advantage of such environmental interfaces is that people interact with the information system by behaving naturally in the physical environment.

There are potential problems. Some can arise simply because the interaction is so effortless: it can be different from what was intended. People may, for example, be presented with information they don't want. Some might feel under pressure to share information they would rather keep to themselves. Indeed, there is the whole question of privacy and the rights of the individual.

But the 'ubiquitous system' concept does seem to be the way the way forward for computing. The techniques will invisibly spread across society, at home, at work, in our leisure pursuits. They will help us overcome the problem of information overload. Most importantly, they will create an environment where machines are adapted to our way of working rather than the other way round. Our interaction with machines will be on a par with our interaction with people, part of an extended, seamless, invisible system.

"People may be presented with information they don't want. Some might feel under pressure to share information they would rather keep to themselves. Indeed, there is the whole question of privacy and the rights of the individual"

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Corel Draw! 2.01 vs Harvard Draw

Corel at last faces real competition for its art package. Will the Harvard contender knock the champion from the world Number One spot? Helen Johnstone scores them nearly even on points — but believes Corel retains the edge, at least for art professionals.

For a long time, Corel Draw! has been the PC world's leading art and drawing package. Nothing came near its competence and professionalism until late last year, when there were glowing reviews for a surprise first foray into art software by Harvard Graphics publisher SPC.

Harvard Draw and Corel Draw! are bound to be compared. Both are Windows-based. Both are object-oriented drawing packages, constructing pic-

them in turn through the toughest challenges we could devise, and see which was left standing.

Corel Draw!

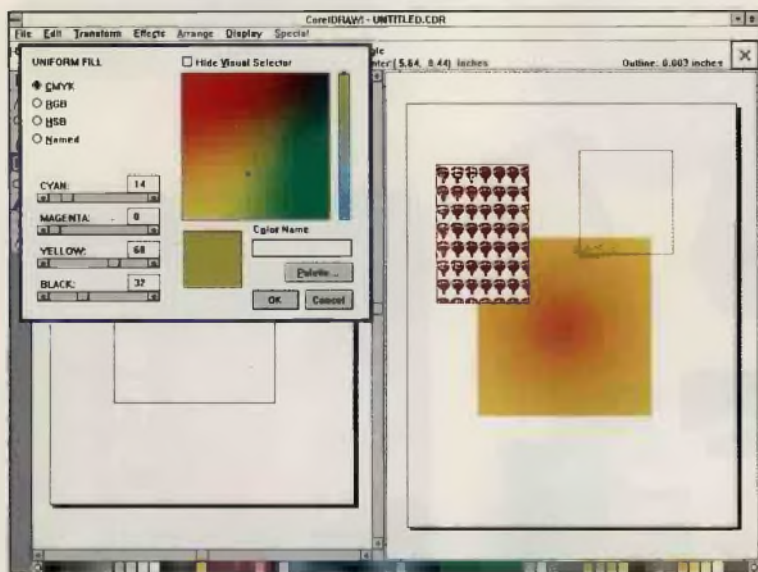
Corel is the most easily accommodated of the packages. It will run on a 286-based PC, although it is far more effective with the power of a 386 behind it. The core package takes up around 10Mb of disk space, and the tutorial files use 2Mb. Clip art can take up to 15Mb if you load it all. At least 1Mb RAM is needed to ensure smooth running, though you can get away with 640K.

The new version (2.01) took less than an hour to set up using the installation program, which also set up three complementary utilities, Corel Trace, Corel Mosaic and Corel Boss. Files are compressed to reduce the number of disks — still, the basic program took up five 3.5in disks.

The Corel screen, like that of most art packages, shows a full page with a surrounding pasteboard area. A toolbox on the left edge gives access to the tools for drawing geometrical figures, colouring, text, selecting objects and changing the screen view. Rulers can be added to the top and side. A scrollable bar of colours is laid along the bottom of the screen.

A status line under the typical Windows menu bar gives the horizontal and vertical position of the cursor to 0.01 cm, plus information on the element being worked on — the height and width of a rectangle, say. The name of any fill colour is given beside a preview box.

Corel shows figures and symbols in what is known as 'wireframe' mode. You get only a thin outline, without the patterns and colour that figures will have when they are printed. Corel has been criticised for not being able to work in Preview mode. As an alternative, it allows the screen to be split into two windows. One holds the Preview, while work can continue in wireframe in the second window. In the end, I preferred this approach



△ Corel has an impressive range of easy to specify fill patterns

tures from a combination of separate objects or figures. Both are aimed at professionals as well as amateurs. Both deal with the colour conventions of the design world and both can produce art that doesn't look computer-generated. And both cost around £450.

Where they do differ is in the details. Some of Corel's best features are missing from Harvard Draw, but Harvard has an impressive range of its own. The only way to get their measure was to take

because it allows you to see the fully fleshed-out picture with no screen redraws interrupting the flow of your own drawing.

Good at figures

The first of our tests was a simple figure-drawing exercise. The drawing of rectangles, ellipses, polygons, and lines, lies at the heart of an art package. If these features aren't easy to use, the rest of the package is likely to be a struggle as well.

Corel's performance as the leading art package could hardly be doubted, and its figure drawing was both intuitive and fast. Rectangles and ellipses are created with tools held in the toolbox, used in conjunction with the control button to produce squares or circles. Polygons are a simple matter of connecting segments of the line tool.

The line tool can be used in Freehand or Bezier mode, with straight lines created by clicking the start and finish positions. Resizing is a matter of grabbing a corner node and moving it; and moving the objects can be done by measurement or freehand.

Bezier and other curve drawing is simple and easily adjustable. Curves are smoothed by ignoring changes that do not last longer than between 1 and 10 pixels — you set your preference via a pull-down menu. Considering that few of us hold a steady mouse, this is a useful feature. Not surprisingly, Harvard Draw matches it.

The only problems came in adding colour. Simple shapes are filled by using the Fill tool and the colour bar. However, the areas created by the line tool cannot always be filled with colour. The tips of a five-point star, drawn with the line tool, were filled as expected, but the centre area was left blank.

With a preview screen alongside the wireframe view, the effects of the colour can be seen almost immediately. The Fill dialog box holds a preview of colours and effects, which is much faster and more effective than the small square of unnamed colour Harvard gives in its preview window.

Graduated colours

A number of tricks and effects can be used on the basic colour. Graduated colouring is possible between any two colours in the menu, or from a customised palette. It works either as a pattern radiating from a point or as a wash from one side of the shape to another. A number of predefined patterns can be used to fill the shapes and a selection of two-colour patterns can be repeated over an area to give the effect of tiling. A separate tool deals with the outline of figures, setting the width, colour and type of lines.

To stretch their capabilities further, Corel and Harvard were put to work on creating a simple landscape. The basic background was no trouble for Corel. Two rectangles were used to form the sky and land, and filled with colour. More complex items were created by combining the shapes produced using the drawing tools and using the Group facility to fix them together as an immutable image.

To elaborate on the initial landscape, editing was taken down to the level of the individual handles or nodes. The shaping tool could then be used on selective points to stretch parts of the images. Points could be added to make adjustments

more sensitive, or removed to release part of the line. This could be used to amend mistakes, as well as to develop the appearance of the drawing. Putting a number of new handles along the lines of the horizon could give the impression of rocky or uneven ground.

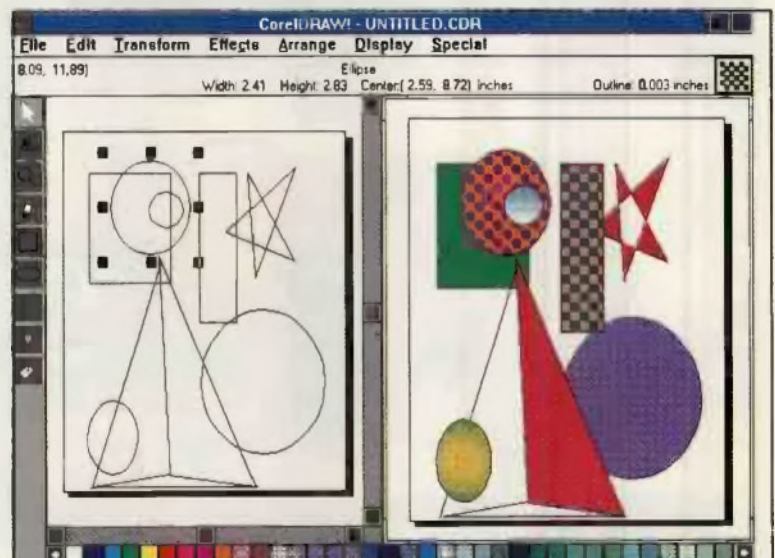
The text test

The next test was on Corel's ability to deal with text — the area in which Corel stands far above any of its competitors. Text can be added into a box marked on the page, or from a single starting point. The typestyle and point size are specified when text is typed into the text dialogue box. A preview box shows an outline of the text in each typestyle, and at the size it will appear, before it is added to the page.

Once placed on the page, the text can be transformed using any of the features that would be used for objects. There's nothing unusual in that. What is unusual is that it is possible to get the text back into a text dialog box, after it has been skewed, stretched, coloured and the perspective altered. The text can then be edited — or changed entirely — and the new text will be put in place of the old text on the page, as skewed, stretched and transformed as the original.

Large amounts of text can be handled. Corel uses wraps, flows and styles like a DTP package would. In fact, it rather cheekily does much of the layout and design of a DTP package, just as a sideline. ASCII files can be imported, or up to 4000 characters typed in. Eight columns are possible and the point size can be set between 0.7pt and 1440pt.

In addition, Corel can place an envelope around



the text for further editing. The envelope follows the outline of the text as a block, forming a loose box around it. This envelope can then be pulled about and reshaped and the text will fit itself automatically to the new outline. Perspective can be added at the same time. All changes can be carried out in a matter of seconds.

The beauty of Corel is that the package remains simple, even as the features become more complex. It is not packed with gimmicks, but is a useful and responsive package for the artist who wants to learn

△ The best way to use Corel Draw! is to display the colour preview alongside the wire frame

the tools of the computer-art trade quickly and get on with the art.

Harvard Draw

Turning to the challenger. Could the novice Harvard Draw present a serious threat to the experienced Corel? Harvard stumbles at the first hurdle. Corel can be run on an average PC. For Harvard Draw, you will need a highly-specified model — at least a 386, with 20Mb for the basic program and a further 40Mb for samples, clip art and tutorial files. A customised installation is possible, in order to save space, but accessing the library from the floppy

are given cursor co-ordinates to 0.001cm, but not a full description of the figure, nor the name of the fill colour. In compensation, an extra bar has been fitted at the bottom with hints on the operation of the selected tool. *Two-one to Corel.*

Harvard's extensive Toolbox was a bonus for the first test, to create some simple, geometrical shapes. Not only does it hold the typical rectangle and ellipse drawing tools, but also a polygon drawing tool, and three for line drawing — freehand, Bezier curves, and a Pen option which automatically smoothes curves drawn freehand. It's no more than Corel is capable of, but with all the options in the Toolbox you can switch between them instantly. With Corel, you have to go through the pull-down menus. For new users, the ease of figure drawing is a mark in the favour of Harvard. *Two all.*

An elaborate view

You can work in wireframe mode, as with Corel, by using Harvard's elaborate view options. These allow up to nine windows, holding preview and outline images, or symbols and patterns from the library. You get an imitation Corel screen by setting two windows to hold the preview and outline. The only restriction is that no more than one symbol or pattern file can be open at one time.

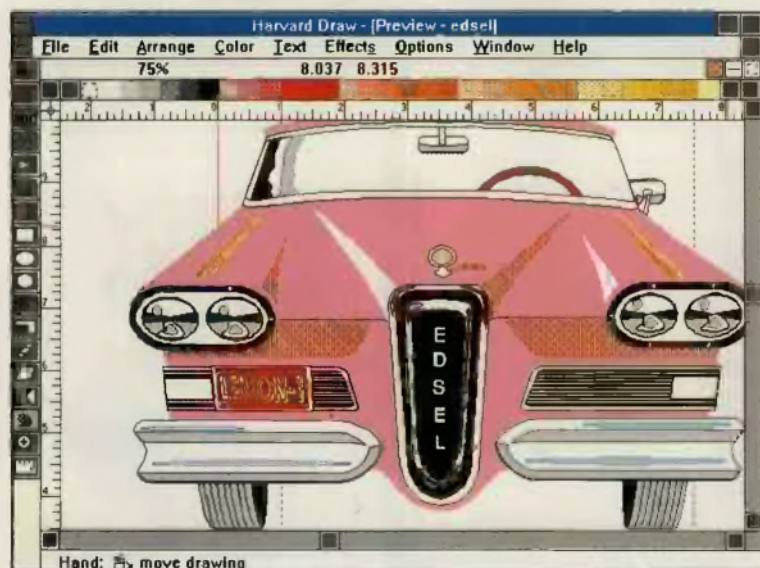
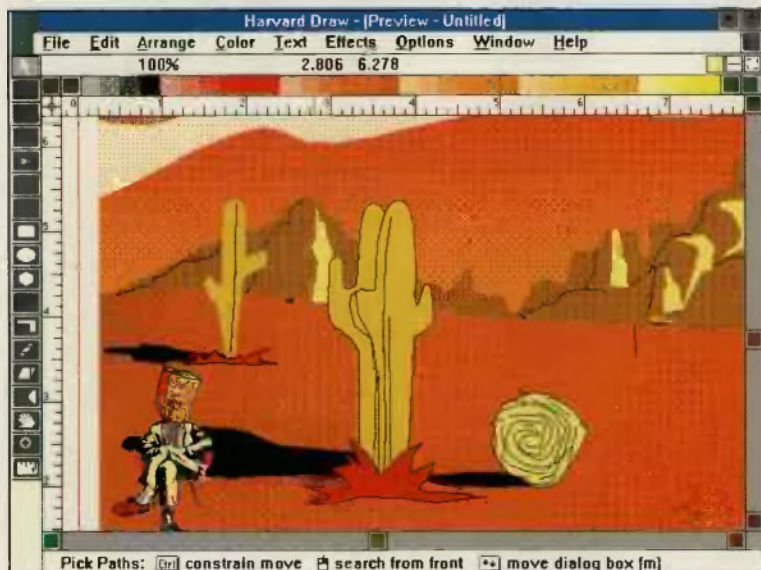
Moving the figures was an intuitive process. Harvard beats Corel at this stage too. It offers a wealth of options for setting the figures on the page, aligning them with the page or each other, and snapping them to custom-drawn grids. Only resizing was cumbersome, requiring a special scale tool. *Three-two to Harvard.*

The next step was to add colour to the figures. Here, Harvard uses a pull-down menu. Personally, I found Corel's toolbox submenu easier to deal with.

Harvard seems to be trying to outdo Corel in colouring methods. Where Corel offers a choice of four or five patterns, Harvard offers a selection of files, each holding 10 to 20 patterns, and a means of making custom patterns. Graduated colouring is radial or unidirectional in Corel. In Harvard, a graduation can be applied in a huge number of ways. It may take the form of a square, a five-pointed star, or any of seven other shapes on the menu. The number of steps to the blends is then set, and whether the blend is balanced across the figure, or whether the focal point is offset. Such a high level of customisation deserves a point. *Four-two to Harvard.*

However, as the customisation becomes more complex, so do the methods behind it. A whole series of dialogue boxes have to be worked through. Once I'd made a mess of a 12-pointed star-shaped, offset, custom-coloured gradation, I lost the enthusiasm to try again.

The Harvard options for layering are also a little over the top. A maximum of 99 layers can be set. Harvard suggests using the conventions of basic programming, setting the back layer to 10 and numbering the layers in progressive tens to allow extra layers to be inserted afterwards. This approach is more technical and precise than the Corel approach, in which each figure can be moved back or forward one layer at a time, but this is ultimately a matter of individual preference.



△ Ford's Edsel may have been a lemon, but Harvard Draw isn't

drive would be awkward as the disks are not labelled. The installation itself took two hours, twice as long as Corel, and required eleven disks. *One-nil to Corel.*

In appearance, the two programs are very alike. The most striking difference is the toolbox. Harvard's eighteen tools make a dazzling array compared to Corel's nine, but there is little difference in scope because Harvard tools do not work with menus.

The Harvard status bar, also underneath the menu bar, gives less detail than Corel Draw!. You

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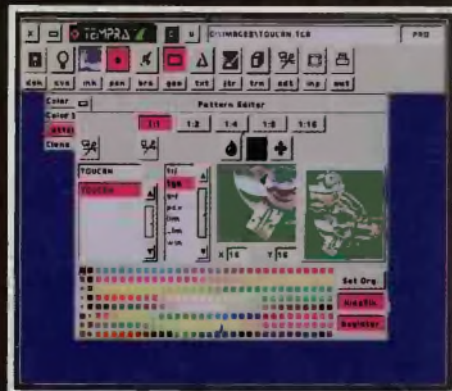
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On the landscape test, as with Corel, the separate halves of the picture had to be created as touching rectangles. This time, though, they could be aligned more easily and then locked in position. Adding objects to the scene was where Harvard began to fall behind. The polygon tool lacked flexibility and setting the attributes of each was too complex. The mind-boggling list of options became a time-consuming nuisance, when several dialog boxes needed to be negotiated for even small changes. The final picture, despite taking longer to produce, looked much the same as the Corel picture. *Four-three to Harvard.*

Adjusting shapes

As with Corel, the next step was to adjust the shapes to look less like they'd been produced by computer and more like a natural landscape. Reshaping by moving a chosen handle independently of all the others is one of the easiest features. Working with the Pick Points tool from the toolbox, any handle or selection point can be dragged out of the original outline. To add an extra handle or change the nature of a handle (for example, from a curve handle to a line handle) you must resort to the pull-down menus. On balance, it is no better or worse than Corel.

Corel's text handling capabilities are hard to beat, so it is no surprise that Harvard Draw fails to do so. Text is added directly to the page and the attributes applied afterwards. This is a clumsier

way of working and although a preview of the text is given, it is not as well presented as the Corel preview. Fewer fonts are included and only point sizes between 2 and 200 are provided. Changes are slowed down by the screen redrawing and changing the colour or outline of the text is far more awkward than with Corel. *Four all.*

Like Corel, the text can be fitted to a path, shaped, stretched and rotated, and still edited as text at the end. Harvard also has a number of special effects for the text, including blurring, shadowing and adding perspective. However, by designing the text manipulation as 'special effects', you have less scope to create your own effects. I suspect that the powerful envelope and perspective editing features of Corel will respond far better to the imagination than these special effects. *Five-four to Corel.*

Harvard is really in its element with special effects. You can easily spiral or repeat objects and the results can be spectacular. An AutoTrace tool has been included for use on imported bitmapped images, and finished images can be made into slides or exported to a printer. A feature unique to Harvard is the mouse controlled zoom. In the Pick Paths mode, a single click on the left button zooms in by a preset increment and a click on the right one zooms out again.

The list of features is enormous. For an untrained artist, the special effects can help produce highly professional results. Unfortunately, the power of the program is unleashed only when the methods have been mastered, and some of the more complex operations look clumsily designed in comparison with Corel.

Conclusion

Despite holding the lead for most of the test, Harvard eventually came out behind Corel. Harvard holds the advantage in general features, thanks to its extensive toolbox and an impressive list of special effects. On the more complicated manoeuvres, however, Corel shows its strength.

Corel Draw!, benefitting from the experience of age, has some complex features that run very smoothly. The Edit Envelope and Edit Perspective operations cannot be matched in simplicity by Harvard Draw. Neither is working with text as neatly designed. By contrast, Harvard Draw has a list of features as long as the Trans-Siberian Railway. There is no denying the power of the program.

If Corel has a weakness, it is that in making a package as much as possible like an artist's notebook, a few of the simple features of order, such as layering, have been forgotten. Corel also looks reluctant to enter the fray on special effects, although these can be a real bonus to the non-artist.

Harvard, on the other hand, gets perhaps a little too complicated for its own good at times. The functionality is there, but it is often hard to extract. I was also left feeling slightly uneasy that maybe, once you'd tried all the special effects once or twice, they'd lose their appeal. Simple drawing, I suspect, is far more important than a loaded feature list in the long run. Your choice will depend a lot on personal preference.

Suppliers Corel Draw 2.01 from Xitan (0703) 899321, Harvard Draw from SPC (0344) 867100.

Comparison of features

	Harvard Draw	Corel Draw!
Patterns and fills		
Edits and stores new patterns	X	X
Graduated fills	X	X
Radial fills	X	X
Fountain fills	X	X
Pattern fills	Unlimited	80+
Bitmapped fills		X
Transformation Tools		
Selects and/or moves objects	X	X
Rotates	X	X
Skews or shears	X	X
Flips and/or mirrors	X	X
Clips and/or cuts	X	X
Multiple backstep when drawing any path	X	
Perspective effects	X	X
Envelope		X
Extrude		X
Display and Editing functions		
Visual file management	Colour	Mono
Guidelines	X	
Snap to points	X	
Number of zoom levels	10	variable
Ruler measures in inches/cm/picas/points	no picas	X
Nudge	X	X
Interruptable draw		X
Moveable point of origin	X	X
Multiple undo	16	
Type Handling		
Text entered directly - WYSIWYG	X	
Text can be edited on-screen	X	
Kerning and tracking	X	X
Converts text to curves	X	X
Wraps text around curved path	X	X
Multiple columns		X
Text can be treated as a graphic element	X	X
Bitstream and/or Adobe Fonts		X
Number of fonts included	47	150
Font conversion utility		X
Text can be edited after manipulation		X
Printing		
Crop marks or centre marks	X	X
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Process-colour separations		X
Spot-colour separations	X	X

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Sony Data Discman DD-1EX

Sony's Data Discman DD-1EX is an 'electronic book' rather than a CD-ROM player that is being marketed as consumer electronics rather than computing. But with a sloppy software base that won't translate and no established graphics format, it's destined for developers, says Simon Rockman. Suzanne Vega lightened the mood a little, though...

Mark Twain was the first author to produce a manuscript on a typewriter. In 1874 this was deemed to be folly: he paid \$125 for a Remington Mark I, when a pen would have cost him a good deal less than a dollar. The Sony 'electronic book' player will cost £350 when it goes on sale later this year, and by the time you have included a few pictures, holds as much information as a large multi-volume dictionary or a small encyclopedia. It weighs around 20lb less but has a battery life of around two hours. On the face of it a book seems a better bet, but then, if the likes of Twain (and the typewriter's inventor, Christopher Sholes) had been put off by the disadvantages of early typewriters, the keyboard you type on would be very different.

The keyboard on Sony's Data Discman isn't the oddest thing about it. The most obvious omission from the design are the words Don't Panic which are missing from the lid. This is the closest anything has got to the *Hitchhiker's Guide to the Galaxy*, and some of its faults are shared by the fictional book, but we'll look at the software later.

Schizophrenic nature

The unit looks like a pregnant version of a standard Discman, a bit narrower (it will only take 8cm CDs) and at 108 x 43 x 159 mm it's quite a bit taller than a modern player. It is also a reasonable weight, at 705 grams with the rechargeable battery. The nomenclature DD1 stands for Data Discman 1, and EX is for export. It is bedecked with controls, buttons and ports which reflect the schizophrenic nature of this combination of computing and portable hi-fi. The power-on switch doubles as a play button and the off as stop. Fast forward and rewind (skip back a track) buttons only affect the audio side, as, obviously, does the volume control. A hold switch turns off all the external buttons, useful if the Data Discman is being used on the move and the buttons

are likely to get knocked. There are jack sockets for power (9v), headphones and composite black and white video. The video lead and PSU are included.

Pressing the Open button lifts the lid to reveal the 'speak and spell' rubberised keyboard. Each key is a separate rubber nipple, more reminiscent of an early Oric computer than anything Sholes laid his hands on. The five pale blue function keys have their functions mapped out on the screen.

The keyboard isn't up to much, and it is the function keys that will be pressed most. Legends on the screen reflect the functions of the keys: F4 doubles as an Esc key. Most of the actions involved in using the Data Discman will rely upon the games machine style cursor pad and the Yes and No keys. These are right at the front of the machine and are all different sizes, and they're as awkward to use as they look.

Greyscales

Inside the thick lid is the screen, which measures 67 x 56mm (and is correct for an NTSC aspect ratio). The resolution is 30 characters x 10 lines or 256 x 200 pixels; the font (conforming to ISO-8859 with 8 x 16 pixels) is thin and spindly, so software could improve upon it. There are no greyscales. Under software greyscales can be emulated by flicking pixels on and off, relying upon the persistence of LCD to generate a shade. This trick is used by Nintendo Gameboy games, but would cause problems with the composite output.

The screen is monochrome, with the advantage that it does not need a backlight. There is one, but turning it off has distinct power-saving advantages, stretching the consumption from one charge from 2 hours to 2.5 unlit hours. Alternatives to the clip-on nickel cadmium battery pack include a supplied battery case which will take ordinary dry cell or alkaline batteries, and a 9v power supply. There is

an optional car adapter which uses the cigarette lighter socket.

The manual warns against using other manufacturers' PSUs since the polarity of the socket has been reversed. You should also avoid plugging the power supply in when running off dry cells since this will flatten the batteries. The machine will charge the battery pack from the PSU, and the screen reflects this and will show the state of charge. This cannot be completely accurate due to the characteristics of NiCads and could have been solved by using nickel hydride or lead-acid batteries. The ordinary battery pack takes six AA cells. Given that the batteries have to supply power for a computer, a motor, a laser and 2 hours' backlight is not bad going for rechargeables, with dry cells lasting five hours (six without a backlight). To conserve power, the Data Discman turns itself off after twenty minutes of idle time.

The alternative to the screen is the composite video output. As befits a machine designed to be used by the international traveller, the composite video can be switched between NTSC and PAL/SECAM television standards — but not while the power is on. Output isn't modulated so you won't be able to plug it into a hotel TV.

The results from an old Commo-

dore monitor (actually a badged Philips screen) were reminiscent of the homebrew days of home computing: that is, a not particularly steady monochrome picture. The manual says of this: 'When the displayed information changes, the screen may flutter. This is not a malfunction.' The com-



The Data Discman which goes on sale this summer has been available in Japan for some time where it is popular with translators. Unfortunately, most of the discs are only available in Japanese

posite video lead, with a typically Sony non-standard plug on the Data Discman end, is supplied but I suspect most customers won't use it.

Optical store

Discs are held in 'caddies'. This is enough to promote the product from 'disc' to 'electronic book', and Sony is keen to stress the difference. Each caddy measures 80 x 88 x 5.5mm. Electronic books are slid into the player which is opened by lifting the keyboard. As the book is slid into place, a roller arrangement slides the shutter on the caddy open. This mechanism didn't always locate itself accurately and caused the disc (sorry, book) to jam. The jams may have been down to the pre-production nature of the review machine: it certainly didn't have the nice, tactile Sony feel I expected. The electronic book pops out automatically when the lid is lifted.

The use of caddies has caused some disquiet among developers for Commodore's CDTV who argue that software houses can expect to pay more for the caddies than they do to have the discs pressed. You can expect to pay more for an electronic book than for a CD. The caddy has some mechanical advantages when it comes to locating data, especially with cheap mechanisms, and in an application where the unit is liable to suffer some rough treatment, such as on a boat or in a car, there are good reasons. Discs can be played without a caddy, but this requires audio discs which are rare in 8cm format in the West but are popular in Japan. The manual gives instructions, showing how to remove a disc from the electronic book, so you could replace the American dictionary (see 'Software') with Suzanne Vega — a good idea, I think.

Audio facilities

The audio facilities are a nice addition but not a primary reason for buying a Data Discman. You can buy a far better, smaller player for almost half the price, but since the ability to play music has to be incorporated it's good that the ROM-based software takes advantage of some of the available features. When a music disc is playing, the screen shows the track being played, the total number of tracks, the total time on the disc, elapsed time and the play mode. There are four modes: normal (straightforward playing), 1 repeat (repeat a section), all repeat (which on some CD singles is the same as 1 repeat), and shuffle repeat (which plays the few tracks on a CD single in random order).

I was disappointed that the player does not support CD+G. This is an established graphics format (hence the +G) which is commonly used to add lyrics to backing tracks for cheap Karaoke systems. As Sony is so friendly with Philips (which seems to be keen to promote *anything* that is not CDTV), CD+G would have been an obvious political move. The graphics would suit this kind of player, as they are teletext-like mosaics. There are a few mainstream CD+G discs available, including the *Dirty Boulevard* 8cm disc from the US single by Lou Reed. CD+G uses an otherwise unused 2K area on each sector but alas, on the Sony this remains unused.

As with all CD-ROM systems the disc format is ISO 9660, but as this unit is Japanese by birth there

is support for JIS as well as ASCII text. Audio quality from the single 16-bit DAC is acceptable. I think my cheap Discman sounds better, but then I had only the aforementioned Suzanne Vega CD to test and am no audiophile.

Software

Any new machine is made or broken by the available software base. In Japan this is substantial, but most of that won't translate. The Japanese version is used by translators who want to type in Katakana equivalents of English words and produce an accurate translation; the 1EX version is billed as multilingual and will cope with 12 different languages: Danish, Dutch, English, Finnish, French, German, Italian, Japanese, Norwegian, Portuguese, Spanish and Swedish. The obvious application is multilingual dictionaries, but if the supplied example dictionary (in American from badly translated Japanese, by the look of it) and the encyclopedia of weapons are anything to go by, I'd want to have a good look at the software before buying a Data Discman.

Unless I was a developer, that is. Sony is actively promoting development systems, offering help with the design and storyboarding of programs, bureau services for data capture, data conversion, data refinement, disc simulation and emulation, and making a master tape before you pass the tape on to a replicator for mastering, duplication and packaging. Sony will also sell you caddies.

In use

There are seven ways to search a disc, and none of them were particularly easy to use thanks to the dreadful keyboard. Most obvious is the word search, where you type in the word and the machine trawls through the index until it doesn't find the word you want. Then you realise you mistyped it, then you find that there is no line editor and you will have to delete the word and type it again.

More successful, in that it cuts down typing mistakes, is the endword search where you specify the last part of the word to be searched for. Yes, it is the same as a word search but Sony sells it as a separate feature. These searches can be combined or modified to look for entries with occurrences of several words, but there are no OR-type logical operations.

The indexing system allows you to search through menus, and there is a graphics search which was not supported by either of the discs I had. The most useful search type is a Hyper Link system which cross-references entries.

I was disappointed with the supplied software which suffered from spelling and grammatical errors. With so much text this is inevitable; my finding them is not. The disc stores 200Mb of data which, allowing for compression, Sony claims is the same as 100,000 pages of paper and would weigh 500lbs. Software is a problem Sony can solve, and in vertical markets it is less of a concern.

Documentation

The DD1 is sold as a consumer electronic device rather than a computer, which is sensible. After all, you can't program it and it is a deliberately closed system with no I/O or expansion options. The manual reflects the nature of the beast and is

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▷ **Electronic Books** are discs in a 'caddy', but the Data Discman will play 8cm format music discs by placing them on the clamp



limited in technical content. Most of it states the obvious — the backlight switch turns the light on — and warnings (*do not connect the PSU when using dry cells*) are often hidden. At least the whole thing is in English (it often makes economic sense for manufacturers to print a multilingual manual).

Software documentation is similarly skimpy, but with a unit which is designed to be easy to use this should be the case. If 200Mb isn't enough to store all the on-screen prompts you need, then something is seriously wrong.

Conclusion

The price looks very attractive: £350 is cheap for a CD-ROM drive. The Data Discman offers a lot more, though, with a computer and keyboard but no interface — or even a chance of interfacing the machine to your PC.

It has taken a long time for the CD-ROM to become an accepted medium. The Mac world is better than the PC world in this respect, but until drive prices come down it will be some time before software is widely distributed on CD-ROM. There is no excuse for the prices. Audio CD players are commonly available at around £50 and a similar sum should pay for the electronics and driving software.

The build quality of the prototype I reviewed wasn't first class, but such problems can be put

down to its pre-production nature coupled with the hard life such machines lead, being taken to shows and sent to prospective developers on the back of motorbikes. Sony claims that each disc stores 100,000 pages of information and there are plenty of businesses which could make use of a portable system with this kind of store, but most of them have too great a degree of volatility in the information to merit pressing discs every time lists need to be updated. A writeable disk would solve this problem and it is safe to assume that such a system is under development. Some suitable applications, like the books-in-print system used by libraries, have already been computerised using 13cm CD-ROMs.

The screen resolution isn't really suitable for mapping applications, so Sony has got it pretty much right in calling this an 'electronic book'. Whether it is quicker to use than a paper book depends on how many search criteria you are using and how quick you are at turning pages, but it would regularly outstrip me. You can even use it on the Tube and in the kinds of places you would want to take a book. Swatting flies might be a little foolhardy but then no-one ever suggested that Sholes give up on the typewriter because he couldn't stick it behind his ear.

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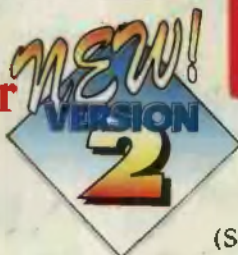
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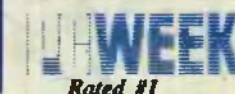
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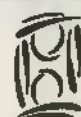
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Graphic demonstration

When you give that deal-clinching presentation, it pays to be armed with a batch of professional-looking slides that can be easily created with a wide range of business graphics packages. Mat Beard and our reviewers help you make a good impression.

Most people have been to a presentation of one type or another. In fact, everyone who has been to school has had to sit through many, the only visual media being chalk (coloured if you were lucky) on a blackboard. The extent to which you were bored would depend a lot on the amount of preparation that the speaker, or teacher, had done. Had he used one of the packages on test here, he might have managed to hold your attention just a little longer.

In the last presentation graphics round-up we did ('Presentation World', PCW November 1990), such packages were relatively new and Simon Rockman stated that *'Hardly a month goes by without the release of a new desktop presentation package'*. This is not quite the case any more. The major area of development now seems to be in upgrades, particularly from DOS-based programs to Windows. Some people, however, consider such a change to be a downgrade, especially users of Harvard Graphics 3.0.

Serious money

Whereas word processors, spreadsheets and databases are commonplace (virtually everyone with a computer uses at least one of them), presentation graphics have a limited fan club. There just aren't that many people who have to give presentations — and those who do will need some serious money in order to use one of the packages on test here. Apart from the initial outlay for a PC or a Mac (you may have one already), the software itself will set you back a few quid and getting the output into a usable form, such as slides, isn't cheap.

Once you have decided that desktop presentation graphics is for you, though,

the results can be stunning. Presentation Graphics packages provide, or *should* provide, all the necessary tools for planning, creating and managing visual presentations, whether they be on slides, overhead projectors (OHP's) or computer screens.

Transformations

In this test we look at 19 presentation packages for DOS, Windows and the Mac. The GUI interfaces of Windows and the Mac looked like being the obvious homes for such programs. DOS isn't dead, though, and although both of the leading presentation graphics packages in the DOS arena have gone through Windows transformations, Lotus Freelance 4.0 and SPC's Harvard Graphics 3.0 are still in the running.

The best software from these three groups will be capable of producing virtually the same output, but what separates the men from the boys is the ease with which it can be done. A variety of tools are common to most of these programs, such as producing a graduated background or charts from spreadsheet data, but the best packages have these and more.

The good products have a range of features that make putting a presentation together a whole lot easier, such as an outliner that can be used to automatically produce bulleted or organisational charts. Many give a thumbnail (miniature WYSIWYG) view of the entire set of slides in a presentation and allow them to be moved around, copied or deleted.

Projection

Once you have designed all the slides for your presentation, and produced

your speaker's notes and audience handouts, the software's work is not necessarily finished. If you don't intend to give an on-screen presentation you will have to get your work put onto 35mm slides or acetate sheets for projection. Some packages convert your slides into formats that can be accepted by major slide bureaux, and a few software companies have struck deals with the bureaux so that output from the programs can be sent down the phone line via a special comms package that also handles billing information.

None of the packages have the whole range of features, but some have more than others. The higher specified programs have their disadvantages though; they require fast machines in order to be usable and the amount of disk space required to fully load the templates and clip art is enough to make older machines wince. But not everybody needs all the functionality of the most expensive packages, and you may find that some of the cheaper software will meet your requirements.

Aldus Persuasion 2.0 for the Mac

With presentations becoming important in all but a few business markets, packages that help you plan and perform them are popping up left, right and centre. One of the most popular solutions for the Macintosh is Aldus' Persuasion, Aldus being the people who gave us Freehand and the powerful PageMaker DTP software.



Persuasion runs on both black and white and colour members of the Macintosh family, but specifically requires a hard disk, 1Mb of RAM and System 4.2 or later. Fortunately, serious Macintosh users have well in excess of this specification and anyone who isn't running System 6.0 or later should seriously consider upgrading. The program doesn't directly support the new System 7.0, but it is compatible and will also run under MultiFinder if you have over 1Mb of memory.

Routine questions

As with most professional business titles the program is easily installed and setting up is simply a matter of answering a few routine questions. Once you've done this and entered your serial number, told the program who you are and decided on a place to install Persuasion, only the copying process stands between you and your presentation. The whole thing takes roughly five minutes and uses 3.2Mb of disk space.

Starting up the program produces



the standard Aldus information box and clicking once removes it, leaving five menus at the top of the screen. For a package designed to construct and enhance various types of business presentation, its own initial look certainly leaves a lot to be desired. You don't even get the usual blank document in the centre of the screen — you're simply left staring at the desktop pattern and any open folders. Exploring the File menu and selecting New brings up an untitled window and puts the program into outline mode, ready to design a presentation structure.

Before you can do this, however, you need to decide on a template and several are supplied to provide different presentation styles. Some have been designed for use with black and white overhead projectors, while others work better with colour 35mm slides. Each template, known for some reason as an AutoTemplate, contains a set of master slides which define the basic format for the presentation. Masters dictate font size and style, use of bullets, chart formats and the background pattern, among others.

Master backgrounds

Just to confuse the issue further, Persuasion also features master backgrounds, used to give your work a consistent appearance. The manual says it's best to think of these as masters for master slides, but I must admit to having trouble with that particular concept. A more straightforward explanation is that they are used to put a standard image at the back of each slide, such as a colour pattern or a graphic. A company logo is an obvious choice for a master background.

Once you've settled on an AutoTemplate, outlining the structure is simply a matter of entering all the text that you want to appear on each slide. Persuasion's outliner works in much the same way as any other, with headings and contents laid out in a smart and intuitive fashion. Unlike some others, it also includes a spell-checker to make sure you don't lose that contract because of a little typing mistake. When your outline is complete, clicking on a selector at the bottom of the screen allows you to add graphic detail and colour to each slide.

The graphic design part of Persuasion is an object-oriented system, complete with a set of standard drawing tools and charting facilities. From here you can adjust text and title placeholders, create original graphics, import PICT and EPS images and create no less than 12 different types of chart. Data for the latter can be created internally using a worksheet option or imported from an ASCII or WKS file. Thanks to the very nature of the Macintosh, the program also boasts good font support, and text and graphics can be split into several layers, for use with the program's slide show utility.

The slide show is used for on-screen performances and displays each slide in sequence automatically, complete with a number of selectable transition effects. With the layers tool you can delay the appearance of any part of a slide, effectively adding animation to your presentation. Good use of layers can greatly enhance your work and a tutorial supplied with the package demonstrates this rather well.

Other key parts of Persuasion include a slide sorter and facilities for

Persuasion 2.0 for the Mac

Supplier

Aldus UK 031-220 4747

Price

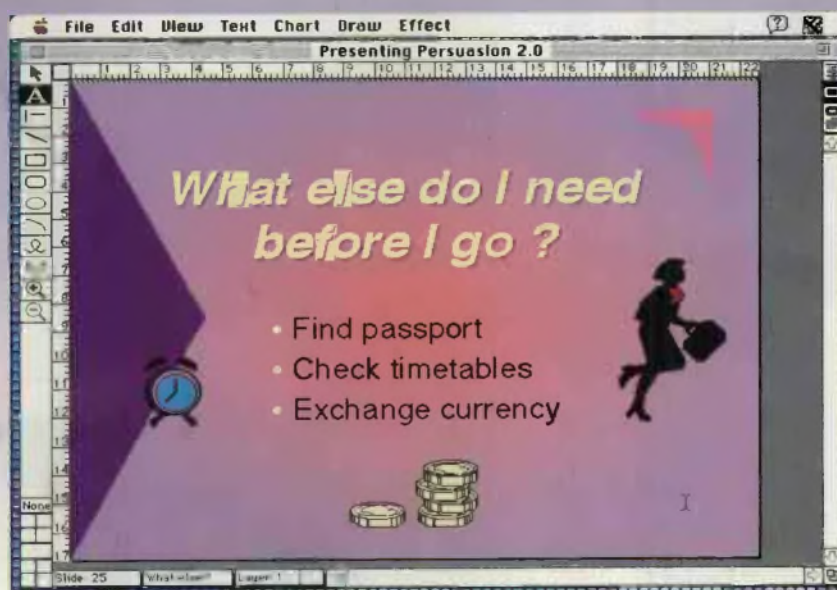
£350

Good Points Can produce truly professional results.

Bad Points Some parts can be complex.

Conclusion Only recommended for those willing to put in some effort.

(A complete table of features for all the packages in this Group Test is on page 300.)



generating speaker's notes and audience handouts. The first allows you to adjust the order in which your slides are presented by moving small graphic boxes around the screen with the mouse. When a new order has been established, the presentation outline is instantly updated to reflect the changes made. The notes section is used to create pages of helpful information for the person who finally ends up presenting your masterpiece, and the audience hand-out utility works in the same way.

Getting a grip

Persuasion is a powerful piece of software that can produce professional-looking slides once you've got to grips with it. Getting to grips with it may take a little time, however, as, despite an on-line help facility, certain parts of it can be confusing. I spent quite some time pondering such things as master slides and the supplied documentation didn't help. The drawing section also requires quite a bit of study in order to produce anything half decent.

Chris Cain

Aldus Persuasion 2.0 for Windows



Persuasion is a powerful and flexible product with which to produce presentation materials quickly and easily. It is marred only slightly by its troublesome registration procedure. A Windows-based package, Aldus offers a true WYSIWYG display of your work, enhanced by Adobe Type Manager (ATM) with which it is bundled. This improves the

appearance and output capabilities of other Windows applications too (like Excel), so is a valuable addition.

Once mastered (not an onerous duty) Aldus does much of the work of presentation building for you. It offers three 'views' in which to work: outline, slide master and slide. These three views are combined to provide the package's formula for a quick way of working: *outline plus slide master equals presentation*. It is highly effective.

The slide masters are sets of 'blank' slides with 'placeholders' for text or graphics, depending on their type. Sets of slide masters accompany the package, grouped as 'autotemplates' with consistent background, general layout, text size and font formats. These can be adapted to include, say, corporate logo.

Prodding Persuasion

To produce a presentation, first select an auto-template. Enter text into the outline, and the two are automatically combined to generate a slide. Simple. Adding data for charts is not much harder, and organisation charts, often

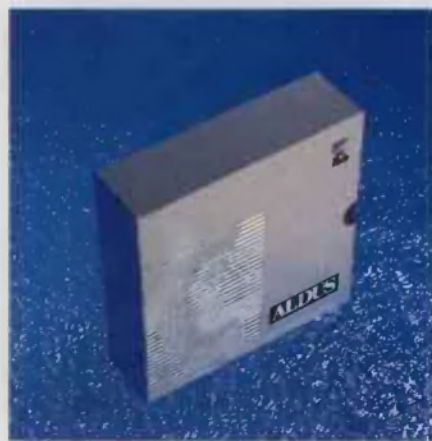
the graphical bane of presentation people's lives, are simply a matter of placing the names and designations in a list, with suitably tabbed indentations to mark reporting lines. Persuasion, after a little prodding, does the rest. Slides can be built in 'layers' which are then displayed sequentially, which can be especially useful when projecting a show directly from the PC. 'Nested' slides are also easily produced from the outline.

Persuasion produces speaker's notes and audience handouts in addition to slides and overhead projector (OHP) sheets. Speaker notes include a miniature of the slide, the title, below which is space either for handwritten remarks, or typed or imported comments and even graphics. Audience handouts include a column of miniature copies of the slide on the left of the page, with slide titles and blank note-lines on the right. These can be generated automatically, in a fully acceptable style, or amended to suit different preferences.

A 'thumbnail' image is available to help you select autotemplates or presentations from disk. A wide range of image construction tools is provided, with a full gamut of object effects, apart from evolve. An on-screen ruler is provided, and although there is no on-screen grid, 'snap-to' can be used with the ruler to almost the same effect. Text effects are good, though text cannot be rotated. Data can be imported from a wide range of sources and products, though there's no external file linking.

Name, rank, and serial number

Installation is generally simple, the install program doing most of the work



Persuasion 2.0 for Windows

Supplier

Aldus UK 031-220 4747

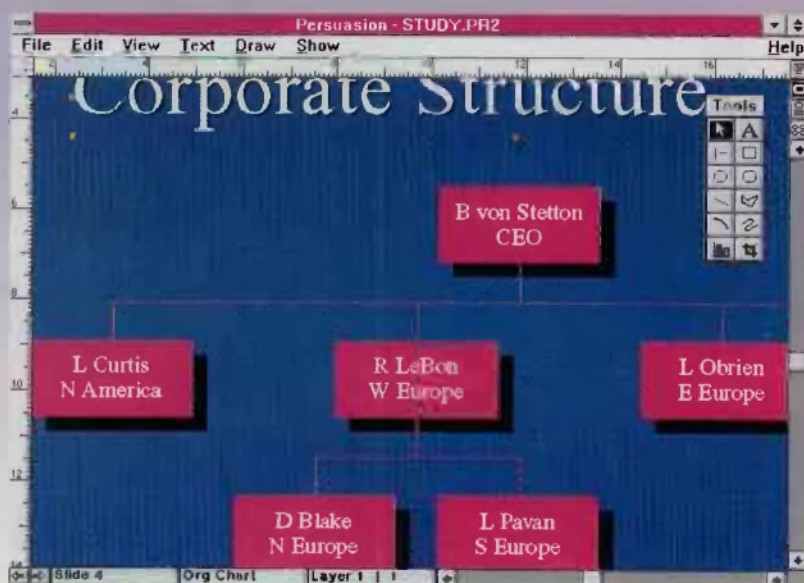
Price

£350

Good Points Easy to use. ATM.

Bad Points Some Windows sluggishness, copy protection.

Conclusion Simple and powerful. A good bet.



and simply asking occasional questions. Unfortunately, one of the questions demands the package serial number. Not, you might think, an unreasonable demand — but the installation routine will not let you go on until a 'valid' number has been entered. Installing Persuasion one evening, I was stopped in my tracks by this screen, and despite entering the number exactly and precisely as printed on the registration card, I got the same message: 'Invalid Number'.

The problem, I discovered the next day and after two phone calls to Scotland, was that the number on the card had been misprinted. *This is completely unacceptable.* Serial number registration is for Aldus' benefit, not mine. It should accept what the user types, and if it is invalid, this will become apparent when the user calls Aldus for support and has to quote the number. *The New Hacker's Dictionary* (MIT 1991) offers an apposite definition of copy protection: 'a class of clever methods for preventing incompetent pirates from stealing software and legitimate customers from using it. Considered silly.' In this case, it mattered not: I was in no great hurry, merely starting a review. What if I had bought it on Friday afternoon to do urgent weekend work on a presentation for Monday? Aldus should consider this carefully.

Windows overhead

Persuasion is certainly not as fast or as simple to use as Harvard Graphics 3, but then not much is. The Windows overhead seems apparent at each switch between slide and outline views, and during outline editing.

Some of the command sequences

are a little peculiar, helping to undermine the myth that Windows is somehow a more 'intuitive' environment in which to work. Producing an organisation chart, for example, while being generally simple, does require the 'Org Chart' command to be selected twice, from two separate menus. Surely one of these is redundant?

Documentation is very good, with a getting started guide containing a two-part tutorial: a detailed and thorough *User Guide*, and a double-sided desk *Reference*, with a colour guide to auto-templates on one side and general *aide-memoire* on the other.

One test of usability in any package is whether you can produce real output in reasonable time, without the aid of manuals. On this criterion, Persuasion scores only modestly; but a short run through the excellent tutorial swiftly and thoroughly remedies matters. This takes only 30 minutes to get the basic principles in place, after which harder matters follow easily.

Passing the test

The real test, however, is whether you can get beyond the first post without a massive investment of time and effort: here Persuasion scores handsomely. I doubt whether any package that is genuinely useful can have you promptly at the top of the learning curve without some investment in tutorial time: the decisions for the package planners is how far how fast. Persuasion has got this right, placing you quickly in a position to create real work, and with plenty 'in reserve' for users who need (and have the time) to access the 'power features'.

Nick Beard

Ashton-Tate Applause II



Applause II is one of the few Ashton-Tate products to survive Borland's cull of the range late last year. Or half-survived; while development on the product has now stopped, Borland is still (grudgingly, one imagines) shipping and supporting the product.

Looking at it historically, it strikes an interesting exception to the general tone of the old A-T products; taking a less-is-more approach, it consists of just one manual, a clip-art index, and a smattering of quick-reference cards. Thin in the box doesn't necessarily mean thin on the disk, though: the main application program still runs to 1.2Mb (overlaid, naturally) and sits in 5Mb of disk space, including gallery.

The price isn't exactly slim, either: £395. It becomes even more ridiculous when one realises that Applause II has always been pitched at the low-power,

Applause II

Supplier

Borland International UK (0734) 321150

Price

£395

Good Points Works on the humblest PC.

Bad Points Has a lot to be humble about. Expensive. Unsupported.

Conclusion Has months to live.



PC-as-dusty-object-in-corner-of-desk corporate market. It defaults to an EGA screen and can run, at a push, in a 512K XT (with CGA). As a DOS program, pure-bred, it will balk at extended memory unless covered by a LIMulator, and display is limited over VGA with only 8514/A, XGA, Paradise and VMI support.

The functionality that users are currently being lead to expect from a high 386 Windows package can still be knocked out from a reasonable 286 AT, and Applause is a perfect example. Indeed, Applause II's feature list reads rather longer than some of the more high-powered packages, largely due to what seems a pretty gratuitous feature blitz in the last upgrade. Useful additions such as a run-time presentation program and network support were drowned in add-ons such as extra screen effects, shelling to DOS, and most improbable of all, a spelling checker. Given that most text in presentation graphics is either to label an axis or to list people's names, the usefulness of this addition seems somewhat doubtful.

Grubby interface

Ashton-Tate (or Borland) would have made much better use of its time if it had turned its rewriting skills to Applause's interface. It's a grubby not-quite-GUI, and it's showing its age. Applause uses three different windowing modes to construct presentations: one for designing each chart, a second for placing charts with graphics, and a third for putting it all together into a slide show. Idiosyncratic even when first released, it is nonetheless internally consistent and clearly explained in the concise *Up and Running* manual.

Frankly, however, even DOS users expect an interface to fit vaguely with the rules of the Windows game. CUA compliant interfaces are just as standard on DOS machines these days as on higher beasts, and most buyers will be frustrated, not resigned, at having to learn a new regime.

Mode switching

The Applause II interface is, for the post-Windows generation, pretty counterintuitive. For much of a chart's life, it's not even WYSIWIG — users have to switch between Review and Edit mode just to cock a peek. Each mode has its own file selection dialogs, and the number of different file formats used by each mode confused me.

Curiously for a presentation package, Applause II under-uses colour to highlight states. It looks scary and technical, and that's the last thing a low-end

business graphics program should be.

All this granted, Applause II can nonetheless deliver the goods, and has no serious limitations as a presentation graphics program apart from the restricted choice of SVGA display drivers. Hardcopy output support is highly respectable, covering a broad array of printers, plotters and film recorders. Bitstream fonts, now of the scalable vector kind, provide flashy text, and imports and export facilities are good, with xBASE .db files (natch), Framework, 1-2-3, SYLK (Excel), ASCII, PCX, DIF, TIF and GIF. Metafiles in GMF and CGM formats can likewise be plucked.

Warm link

Applause II advertises a 'warm link' option, but this is little more than allowing one chart to be attached to similar data sources with the minimum of effort. The changes have to be manually notified, and no automatic updating takes place: DDE it isn't.

All the standard charts are supported, with 3D effects and so on. Data can be manipulated using global spreadsheet functions, and linear, exponential and logarithmic forecast lines can be superimposed, as can moving averages.

The clip art is extensive and varied, and is made up of shapes rather than bitmaps. With clips made up of compound objects such as a map of Europe, Ireland, for example, can be selected and zoomed, then rearranged or recoloured to suit. No thumbnail feature is provided, although there's a clip-art reference booklet in the box.

Creative process

Graphics handling is good, if confusing visually when editing. A facility to draw Bezier curves stands out against the other, vanilla primitives of arc, wedge line and polygon. Text handling is excellent, with changes in font colour and size encodable within text strings, and separate support for organisational charts as well as the more standard word chart formats. DIAGRAM-MAS-TER organisation charts can be imported as-is into this handler. The pack includes some 44 starter charts and a set of 11 seasonal palettes to slough off some of the pressures of the creative process.

The runtime slide show is simple to set up; long shows can either prompt for extra disks while in progress, or be supplied with a utility to install them onto the foreign hard disk. For VIP occasions, Applause II includes a modem or mail link to the mysterious 'Data Controller', who lives in the 'Power House', West London. A utility prepares files that, once sent to this

ominous figure, will be returned within 24 hours on high-quality slides, colour transparencies, colour photo prints or colour laser prints. The phone call is free; prices are not given.

Applause II, then, is a complete but cumbersome package, limited in appeal to DOS managers who have either no wish or no money to move to Windows, and who can live with the fact that Borland will never update it. Its only restriction lies in a user interface that is not faulty so much as idiosyncratic, but it's all there. It's pricey, though.

Dan O'Brien

Borland Quattro Pro 3.01



At first glance you may wonder what PCW is doing including a spreadsheet in its Presentation Graphics Group Test. That was certainly my reaction when asked to review it. Apparently, though, there are many people out there who use Quattro Pro not only as a spreadsheet (bear in mind that this package made the Shortlist in December's Spreadsheets Group Test) but also as a presentation package. Certainly, Borland has provided the tools necessary to produce presentations.

Installation is the standard Borland routine. It is also Windows aware and if requested will create a Program Manager group and install a Quattro Pro icon. A selection of Bitstream fonts is supplied and the installation asks if you wish to create these. It is not vital to create the fonts at installation time as Quattro Pro will create them as required if they don't already exist. Be warned, however, that if you don't then there may be instances in your presentations where Quattro Pro displays a Building Font message in the middle of the screen and starts building the required font.

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The (*) symbols above indicate Windows V3.0 compatible programs.

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Quattro Pro 3.01

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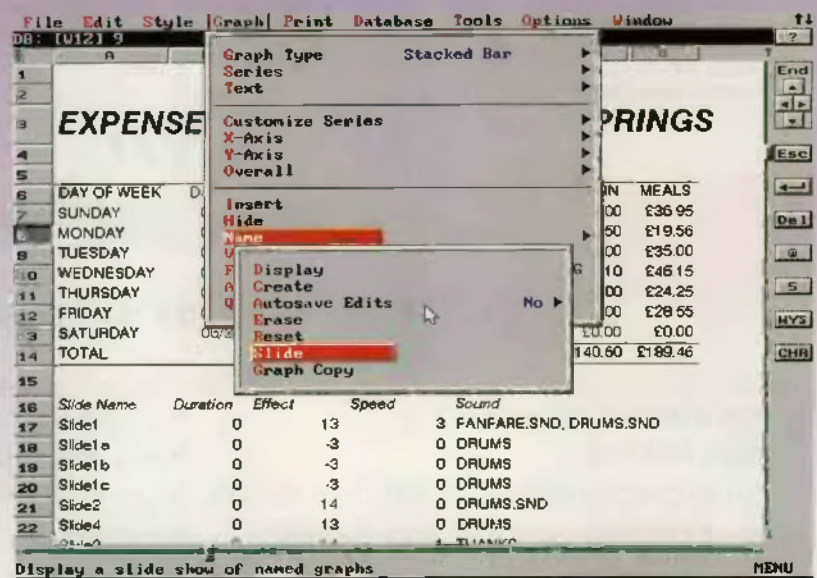
Price

£300

Good Points Good value for money.

Bad Points Requires knowledge of spreadsheets.

Conclusion Presentation package for spreadsheet users.



Loading up Quattro Pro displays a standard character-based emulation of a Windows screen with pull-down menus at the top and a status bar at the bottom. Quattro Pro has two display modes: character based and WYSIWYG. WYSIWYG mode is Borland's idea of a graphical user interface and will be familiar to Windows users. The display mode makes no difference to how the slide show looks, however.

Annotator

To enable you to create slide shows that don't just consist of a series of graphs, Quattro Pro provides a text chart, really just a blank chart onto which you can add items using the Annotator. The Annotator only runs in WYSIWYG mode and enables you to add text, boxes, lines and images.

Quattro Pro's slide shows fall into two categories — the linear presentation and the interactive presentation. The linear presentation simply displays one slide followed by the next until the end of the presentation is reached. Initially you will need to prepare the slides (or graphs). This can be done using data in the spreadsheet to draw graphs or by using the aforementioned text charts.

The next step is to create an area in the spreadsheet that contains the names of the slides to be used. The minimum this can be is a column containing the names of the graphs. Additional columns can be added to specify how long the slide should stay on the screen for, what visual effect should be used to display the graph, the speed with which it should be displayed and which sound effect, if any, should accompany the graph.

The visual effects, of which there are

24, are a pretty standard list of wipes and scrolls, and so on, found in most packages of this type. These effects can also be made to overlay the previous slide to enable bullet charts to be built up on screen.

Sound effects

The ability to add sound effects to a presentation is unusual for a dedicated presentation package, so to find it available in Quattro Pro is a real surprise. While sound effects are fun they are also gimmicky and I'm not sure how many presentations would normally incorporate computer generated sound.

The interactive presentation is where different slides are displayed dependent on user actions. Quattro Pro enables this by allowing you to put 'buttons' onto a chart. These buttons can be set to display another chart or run a spreadsheet macro.

Quattro Pro makes use of Borland's VROOMM technology. This loads small modules of program as required, leaving more room free for the user's data. The minimum machine configuration is 512K of RAM (although 640K is recommended) and 4Mb of hard disk. These requirements should make Quattro Pro an attractive proposition for corporate environments where many IBM PCs and ATs are still in use.

The Quattro Pro manuals are of good quality and reminded me of Lotus 1-2-3's manuals, but then Quattro did start life as a 1-2-3 clone.

Impressive

That a spreadsheet program is even included in this Group Test is impressive. The fact that the presentations it produces are so good is amazing. How-

ever, you are never left in any doubt that this is a spreadsheet in presentation packages clothing. This is no bad thing, but if you want to create a slide show you will first need to understand how a spreadsheet works. If you are already a spreadsheet user and need to produce presentations as well, you could do a lot worse than give Quattro Pro a look.

Ian Baker

Claris MacDraw Pro



Rather like Cricket Graph, this name has been around for some time. Unlike that poor orphan, however, for my money this is the perfect example of how to bring up a piece of software.

Right back in the days of the Mac 128K, when Steve Jobs stood up and said 'Let's show them why 1984 won't be like 1984', the Macintosh was delivered with single-sided drives, no expansion, and three software packages,

MacDraw Pro

Supplier

Frontline Distribution
(0256) 463344

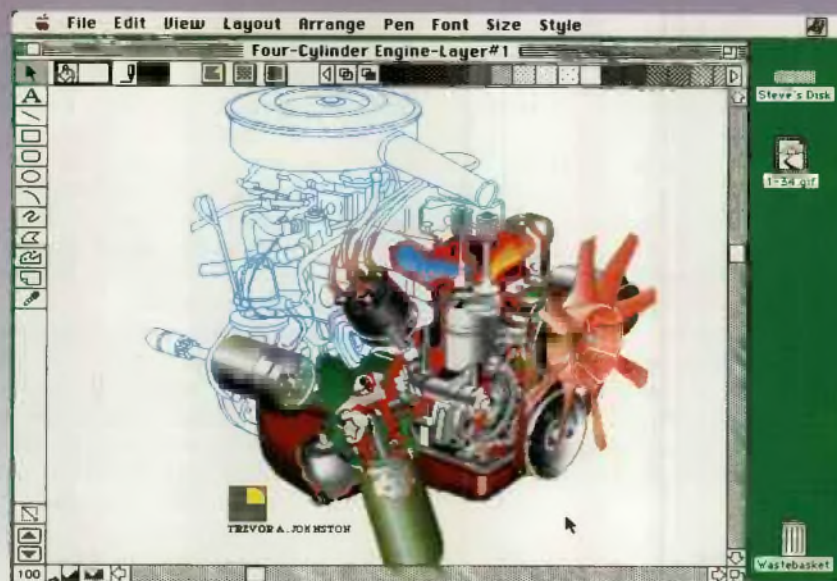
Price

£325

Good Points Apple's traditionally great documentation.

Bad Points Notional features for slide shows, mismatched to the rest.

Conclusion Brilliant drawing package, the best features of which take some winking out.



MacWrite, MacPaint and MacDraw. Nine years later, and Claris Software's PR sent me a box weighing as much as a PowerBook 170 portable. Inside are a clutch of shrink-wrapped manuals (when will software companies follow videotape makers and put rip strips into their shrink-wrap? If you have dentures and need to open this stuff, get a penknife...), and six 800K disks.

Installation

Unusually for a Mac package, MacDraw Pro has an Installer program; it looks a great deal like the installer used to move Apple's system software, or to make updates to low-level OS components like network card drivers. The reason for this choice becomes clear only if you're brave enough to click on the 'customise' button: MacDraw Pro carries with it a number of files for your system folder to help those still using System 6 (like me) to access all the colours and capabilities of the package. System 7 users have 32-bit QuickDraw already built in.

Clicking on 'Install', however, gets you nothing more than a few minutes of disk swapping: like nearly all Mac packages, there's no question of choosing display or printer drivers. At the end of the process, you would be missing roughly 2-3Mb of disk space, depending on whether you have opted for the meaningless, flim-flam 'Hypertour' and the gritty, vital Tutorial. As for the rest, there's the usual set of example files and the program itself.

The MacDraw Pro working environment centres around the drawing space. There's a bar of fill patterns along the top of the window, and a palette of tools to the left. The heritage of the product is

evident — since 1984, all that's been added are gadgets in the fill patterns bar and several new icons in the tool palette. The Claris philosophy has been explained to me as 'adding depth': new features arrive as evolutions and extensions to the old structures, and certainly this is made clear by the low-key appearance of the working environment. The downside to this is that features deemed to be extensions to the original concept can seem 'hidden'.

The basic features, accessible by someone sitting down and having a play without benefit of manuals, are those of an object-oriented drawing package. No chart building facilities here: one selects the appropriate tool and draws a line, a box, a polygon or a Bezigon. Text counts as an object: in effect, a small word processing window pops up on the drawing space, complete with alignment options, all the fonts your Mac setup can deliver, and a ruler for tab settings. The objects may have a foreground colour and a background fill pattern and colour.

Pandora's Box

New in MacDraw Pro is the provision of a Pandora's Box of gradient fills: there's even a Fill Editor, which allows you to define the colours mixed in the gradient, the manner in which the lighter and darker parts of the two intermix, and how the gradient matches the object which it colours. Somehow, these are even represented in a limited sense on old-fashioned mono-screen Macs, which proves to me that Claris has some people who can stretch a one-bit-per-pixel display to the very limit by careful visual design.

Gradients aren't as much of a

Pandora's Box as the generation of naff DTP'd rounded rectangles which were formerly the mark of a design tyro, however: it's only on the largest of image setters, or colour printing and imaging equipment such as a slide-making machine, that these gradients will be done full justice. Printed on anything less, they appear strangely 'banded'.

Other new features include the 'Bezigon', a closed shape built from Bezier curves, a colour palette editor and composer to help you standardise your colour sets (not a foolish thing to want to do when your system may be using a display capable of showing millions of colours), and a hack which takes the existing facility for dividing up a drawing into a number of layers, and terms the layers 'slides' instead. Like a large number of extra capabilities, all these are well hidden in menus and behind combinations of the option, shift and command keys with single and double clicks of the mouse. Whatever you do, don't lose the multi-paged *Quick Reference Guide*: it contains some vital tips, such as how to select all the ellipses in a document.

The layers-to-slides hack, and an addition to a menu to enable an on-screen slide show mode, are MacDraw Pro's main attempts at credibility in the Presentation Graphics market. Once in Slide mode, one of the obscure tools at the bottom of the palette suddenly switches from a layer-flipping control to a 'slide forwards/backwards' control, and instead of the layers seeming to be drawn on acetate and laid one on top of the other, each 'slide' lays over a master slide.

When I have watched and helped

people prepare presentations in previous versions of MacDraw, we didn't work that way. Rather, we had huge drawings divided up into A4 regions, and MacDraw's powerful and fast zoom in and out facilities, from 12.5% to 1600%. This way, all the sheets of a presentation can be seen alongside one another (by zooming out), which provides an 'outliner' as found in PowerPoint, Persuasion or even Word 4. If one uses the supplied, new Slide mode, this strategy is not viable. Furthermore, reordering of slides in the on-screen slide show requires shuffling to and fro through the pseudolayers, rather than just picking up a collection of objects and sweeping them to and fro.

Thoughtless

Given that MacDraw Pro is at heart a powerful and helpful draw package, its gestures in the direction of presenting seem superfluous and of a different direction from its core intent. I will carry on using it as my default product, for jobs as diverse as program flow diagrams, headed notepaper, fiddling with externally generated charts, and nightclub flyers. But for planning a show to win some business or get a point across, I won't be using the additions specific to that task which Claris has so thoughtlessly included.

Steve Cassidy

IBM Hollywood 1.0

IBM's Hollywood was used to produce PCW's Group Test graphs. It isn't any more, but as the people who pro-

duce those charts had a wide choice of software I was interested to see how Hollywood performed.

The program arrives on four 3.5in disks and requires a machine capable of running Windows in Standard or Enhanced mode. The files on these disks are compressed. The Windows-based installation program is well behaved, giving you the choice of which parts of the application you want to install on your hard disk.

The only problem with the installation routine is that it seems to take forever. On my — admittedly slow — machine the installation took over an hour, in Standard mode with no other applications running. While I appreciate that you normally only need to install the product once, it does seem a long time to install 8Mb of data.

Once the files have been copied onto the hard disk, the setup program then creates a Program Manager group and places the icons for Hollywood and associated applications into it. Double clicking on the Hollywood icon loads up the program — eventually. Again



the startup is slow, over a minute on my machine.

Toolbox

Once loaded the default Hollywood screen is displayed. This is basically a standard Windows screen with a menu, work area and status bar. Instead of the tool bar which seems to have become a standard these days, Hollywood has a toolbox, a window which is always fully visible. It contains eight icons, which the manual likens to drawers, with textual labels below. Clicking an icon selects that tool. However, clicking the label will display the other tools in that drawer. Click one of those icons and that becomes the tool at the front of the drawer.

Hollywood splits the type of information you are likely to want to display into two main types — text charts and data charts. Text charts can be either bullet charts or tree charts; text is entered via the outliner. The outliner is a simple word processor that enables you to enter page titles and bullet points. On a tree chart these bullet points become branches on the tree.

Clumsy importing

To display a data chart the first thing to do is enter the data. This can be done manually, by using the clipboard, or Hollywood can import data stored in Lotus 1-2-3 or Microsoft Excel formats. This is done in rather a clumsy way by getting you to open a spreadsheet viewer and then cut and paste the data into a Hollywood table. It would have been nice to be able to bring a spreadsheet range directly into a Hollywood table.

The range of data charts that Hollywood provides is very impressive, with

(Claris) IBM Hollywood

Supplier

Frontline Distribution (0256) 463344

Price

£325

Good Points Configurability.

Bad Points Slow.

Conclusion Unless you have a fast machine look for something else.



some charts that I have never seen in any other package.

Putting on the style

Hollywood provides several facilities for the quick production of presentations, including styles, templates and a master page. Styles and templates work in the same way as they do in word processors, enabling standard fonts and layouts to be specified for a presentation. The master page enables you to have a standard background page for your presentation — useful for adding a corporate logo or background to your work.

Each slide or page of the presentation can consist of several layers. These layers can then be displayed one at a time on top of each other during the presentation. This is particularly useful for bullet charts and graphs where you want to build the picture slowly to keep your audience in suspense. Hollywood lets you do this easily by automatically putting different bullet points or data series onto different layers.

The presentations created are purely linear; there is no facility for providing interactive presentations.

Also provided with Hollywood is an application called Screenshow. This enables you to distribute presentations for others to view without them needing a copy of Hollywood.

The final application, Magicorp Slide Service, is intended to enable you to transmit your finished presentation, either by modem or on disk, to a bureau for transfer onto 35mm slides. No UK contact is given, however, so I am not too sure if this service is available here.

The Hollywood user interface is slightly idiosyncratic. The toolbox con-

cept is unusual, although quite usable. Also, some of the commands are in strange places on the menu. For instance, if you want to change the font for a chart's heading you need to select the Color (sic) Schemes option on the Effects menu.

Slow on the draw

The one major drawback that pervades Hollywood is its slowness. Screen redraws seem to take forever, and it seems to do an awful lot of them. This is a powerful program; unfortunately, in order to make it usable you will need a fast 386.

Ian Baker

Computer Associates Cricket Presents



Cricket Presents crossed from the Macintosh into the Windows environment nine months ago. The product was ac-

quired when Computer Associates bought US developer Cricket Software 18 months ago. It is a business presentation package aimed at the low to high end market; judging from the documentation, the user isn't required to know too much about computers in general. It does offer what appears to be a complete presentation software solution, however, with speaker's notes and audience handouts also catered for. Using a palette of 256 colours in VGA, it can create output on devices including the screen, a black and white laser printer, colour printers or 35mm slides.

The package comprises four separate programs, the main one of which is CA-Presents, the graphics package responsible for manipulating images and text within the actual frames of a presentation. Also included is an outliner, useful for working out what you're going to say and when. There is also a font manipulation program that allows you to preview fonts and remap your keyboard, and finally a program for handling print files.

When installing, the package presents the user with a dialog box that asks which elements of the package are selected. When these are chosen, it still takes up 8Mb on the system disk. The rest of the installation is performed more or less automatically.

Working together

The two most interesting programs are the outliner and the presentation program itself, simply because of the way they work together. CA-Presents has a feature called Autopresents, which takes a topic from the outliner and fits the text into a frame structure defined by the user, thereby saving him/her the

Cricket Presents

Supplier

Computer Associates (0753) 577733

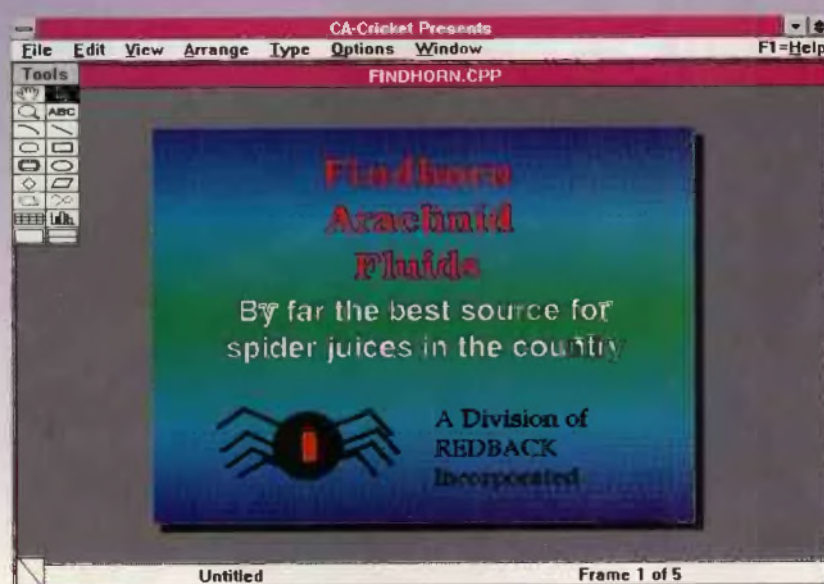
Price

£325

Good Points Good colour handling, templates and outlining.

Bad Points Slow, bad text editing, not much clip art, small work area.

Conclusion Good for patching together presentations in a hurry, but don't try to build your entire working system around it.



trouble of having to write it all out again.

The presentation window itself, however, is something of a let-down. Instead of giving the user the whole window to define a frame, the program only gives up about two thirds of it. There is a WYSIWYG-type feature which expands the picture to about 1.5 times the size of the screen, but this is hardly satisfactory either. Users can define not only individual frames, but also a background upon which all frames are overlaid; standard objects can be included in all frames, such as company logos and symbols.

Text manipulation

Eleven fonts are provided with options to add others, but text manipulation is pretty poor. Not only is it slow to update itself, so the user can easily type ahead of the program, but use of certain text styles produces ragged, poor-quality text when displayed on the preparation screen. The tools for the manipulation of images are object oriented, meaning that an arc or a square, for example, can be defined, moved around and deleted as an object in its own right. This is useful for keeping track of picture elements should the screen get too crowded. It also means that bitmapped Windows metafiles can be 'exploded' — divided into separate objects when they are imported.

Users can import files from packages including Lotus Freelance and 1-2-3, Microsoft Paint and Publisher's Paintbrush. .GIF, .TIF and .TXT files are also among some of those supported. Some clip art is supplied, although not much — only 54 files, in fact. Also included are templates, which allow the user to

model his or her charts or logos around preset ideas.

A charting function allows the representation of data using line graphs, scatter graphs, different bar charts or a pie chart. This feature is quite comprehensive, and enables users to manipulate the size of the graph and add legends easily.

Colour manipulation is interesting but nothing special. This isn't the sort of package which bothers with Pantone, but it does offer you a choice of three different ways to create your own custom colours. You can either use the RGB scale, or you can plump for the HLS colour model. There is also a CMYK colour scale for people who want to send their presentations out to a printing house.

Handling frames is easy, as you can display them by title or by image in a screen which shows the running order. Changing the running order is easy: just move one in front of the other using the mouse. Unfortunately, there is the same problem here as when displaying the frames at full size. They take about ten seconds a time to redraw themselves when you do something to change them. This is very irritating, and although there are ways of stopping it — hiding the graphic images to speed up the redraw, for example — this is simply bad programming which is trying to cover its tracks.

Not a long-term prospect

The main problem with this software is that it just doesn't look or feel professional during preparation, even if it looks OK when the presentation is actually being made. The small screen area, combined with the speed, makes

it unsatisfactory to work with for too long. Although the features enable you to cobble together a presentation in no time at all, I'd rather shell out the extra money and buy a package I'd be happy working with in the long term.

Danny Bradbury

Computer Associates Cricket Graph



It used to be the case, several years ago, that corporate Mac users were looked on as bizarre rebels; partly because they seemed to achieve results without the pain of a 'proper' PC learning curve, but also because deceptively simple applications could be made to do seriously complicated things in their hands. A cornerstone of this strategy, along with MacWrite, MacDraw and MultiPlan, was Cricket Graph. Its maker, Cricket Software, was fêted as one of the very first third-party developers of Mac soft-

Cricket Graph

Supplier

Computer Associates
(0753) 577733

Price

£145

Good Points Some graph types not commonly found elsewhere.

Bad Points No upgrade for what counts as a geological aeon: there are now countries younger than this software.

Conclusion Time-locked old favourite — the VW Beetle of graphing programs.



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ware: the programmers had their time as allotted by Andy Warhol within the Mac community; Cricket Graph became the choice of default for those wanting to, well, produce graphs.

The eighties ended, and suddenly, Cricket Software was bought up by white-shirt-and-dark-ties software giant, Computer Associates. People blinked in surprise, but that was all. Didn't Cricket do that thing that ran well on the Fat Mac?

Yes, indeed it did. And the company's downfall seems to have been that Cricket Graph was *all* it did.

Installation couldn't be easier. On the single disk inside the slim two-tone box there are three files, and a folder containing plotter drivers. These total just 417K, and of these, the main program accounts for nearly 370K. Double click on the program, and you would swear you were looking at a spreadsheet.

Here comes trouble...

Here's where the trouble starts. Cricket Graph is true to its name: it produces graphs, one per file, from data sets which you enter into a rows-and-columns grid. When data has been entered into the grid, you choose a graph type from the appropriate menu and up flashes a graph. One of the special cases within the Graph menu selects plain text: this provides a blank sheet of paper on which you can place text as you see fit.

All well and good, until one starts to tick off the points which make Cricket unsuitable. Firstly, each file contains just the one image, based on one corresponding data file: couplets of data and graph files will start filling up your disk in short order.

Secondly, although there's a Text graph type, it's very much an afterthought: while you can place text anywhere in the workspace and have it appear in any of the typefaces present on your Mac, you also have to enter some kind of junk data in the matching data set. This isn't used anywhere in the text slide, where other packages might have made use of it as headings and bullet points, for instance. It's clear that the 'Text' slide is an afterthought; a neat, well-executed afterthought.

Thirdly, the lack of storage of sets of graphs and text pages in a common file makes it near impossible to take any kind of overview. It's up to you to keep track. While you can move data from one graph to another using the normal Macintosh facilities for cutting and pasting between documents, there's no slide sorter and no slide show facility to preview your grand effort on screen. Confusingly, the format of the graph is

stored separately from the graph and the data.

Strength in charts

Charts are the main strength of the product, and quite a strength it is too. You will find a wide range of sensible, usable graph formats for your data, with a strong bias towards scientific or technical types: this is the only place I've seen a polar-coordinate graph. There are no 3D types, only an option to 'add or remove depth', a kind of 2.5D display: bars acquire a corner and some sides, lines are curiously painted on the back of a recessed display. This isn't the end of the peculiarities: I couldn't make Cricket Graph employ ATM to display font sizes not present in the relevant font suitcase.

The data set can be manipulated in a strangely non-spreadsheet fashion. This includes transformations, 'recodes' to discard values according to a selection expression, and the generation of a smoothed data set in a new column from an existing column. It's 'non spreadsheet' because rather than entering the expression in the grid-like data sheet, all these options are selected from a plethora of menus and dialog boxes. More of the same dialogs control curve fitting by a number of methods, and what the menus describe as 'simple math' — the usual four operators can be applied between columns or to a constant and a column to produce a new column.

Antiquities

More antiquities: half the files on the distribution disk provide a means of driving one of a narrow range of pen plotters, or a specific brand of film recorder. This dates from the days of ubiquitous ImageWriter dot matrix printers, and before the arrival of Chooser-level plotter drivers like MacPlot. Plotters are marvellous devices, and to watch a large, high-performance plotter drawing out almost any diagram is to risk self-hypnosis. However, they are a small part of the armoury available to presenters these days, and good ones cost the earth: no prospect, alas, of hooking up to anything so modern as an HP DeskJet 500C for your colour foils, and the colour assignments are in any case from before the days of the Mac II and standards for colour representation on the Macintosh. There's an option to set the background colour in one menu: anyone who has worked with a plotter will doubtless recognise the futility of choosing any colour other than white...

The manual is chatty but anachronistic, and Computer Associates' total

effort with it seems to extend to a single laser-printed loose-leaf, apologising for references throughout to a 'system floppy' (Mac software used to be shipped with a copy of Mac system software, back when hard disks were a rarity).

Functional elegance

It seems cruel to judge Cricket Graph too harshly. It was impressive in 1986, and some of the functional elegance has remained through seven years of pretty much complete neglect. It is by no means a 'presentation graphics package' in the sense of a product like PowerPoint, but what it does, it does well.

Steve Cassidy

Digital Research Presentation Team



I've got a big heart. I must have: I could have given this review to someone else, but I couldn't bring myself to do it. It's not that I've got anything against GEM software; I just happen to be a member of that large group of people who don't like it.

GEM was fine, when the only competition was the first version of Windows (when I say fine, I mean they were both as bad). Windows has come a long way since then and GEM has been left behind. The advancements made by Windows call for some serious processing power in order to run the program properly. GEM, however, can be run on a bog-standard PC or XT with 640K of RAM, so it does have its advantages.

Award for literature

I have seen the documentation for all the software in this Group Test and if there were to be an award for the largest amount of literature supplied, Presentation Team would win hands down.

Presentation Team

Supplier

Frontline Distribution (0256) 463344

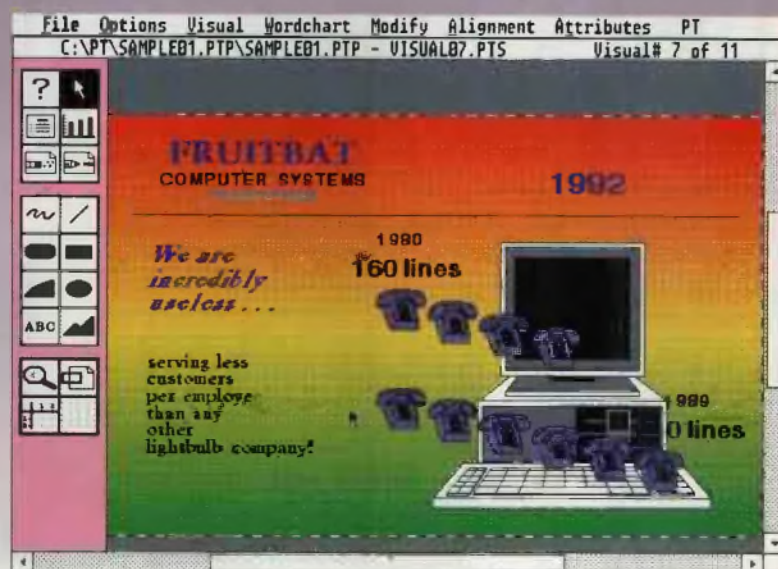
Price

£395

Good Points Works under GEM.

Bad Points Works under GEM.

Conclusion Works under...



Unfortunately there isn't going to be such an award, which is a shame as it's the only thing that it *would* win. It may have been a contender for the 'most disks' award with ten, but Lotus Freelance beats that easily.

Inserting disk one in the floppy drive and typing 'SETUP' gets you started. You are then asked a series of questions about your system, one of which is about your display type. Now, I know the software isn't likely to be running on a 33MHz 486 with a Tseng Labs ET4000 chipset video card, but that's no reason for there to be no support for such a setup: I had to settle for normal VGA resolution with 16 colours.

Looks bad

Obviously 16-colour screens aren't going to look as good as 256-colour screens, but I had no idea they would look so bad, or that you would be limited to the 16 colours chosen by the software. To test this I tried changing my Windows settings to the same resolution GEM was using and running PowerPoint. I was right; with a decent program you can still choose from a wide range of colours, even if you can show only 16 on the screen at any one time.

Presentation Team's limitations with colour become horribly clear when you create a graduated background. This is a simple enough operation — just double clicking on the blank worksheet brings up a 'fountain' box. The first choice you are given is whether you want a straight gradient or a radial one; the colour blend can then be either linear or on a logarithmic scale. You can choose a start and finish colour from the 16 provided. All seems fine, but when you apply the gradient to the

background, the transformation from one colour to the next is made in about four bands across the screen.

A wide range of tools are provided, for both text and graphics. Bulleted charts can be easily created; when a text box has been drawn, a ruler appears which can be used to alter the position of tabs and indents to determine where the bullets appear. The text itself is limited to two typefaces, Dutch and Swiss, and the maximum size for both is 48 points. At maximum size the text is jagged — there's no Adobe Type Manager here.

A reasonable selection of drawing tools are available, which makes up in some way for the lack of clip art supplied. Objects can be rotated, flipped, grouped and ungrouped, brought to the front or sent to the back, repositioned and resized. There is no way to directly import the commonly used graphics format files, such as .PCX, .BMP or .TIF, but the package is accompanied by the Hijack graphics conversion program, so that's not a major problem.

Importing text or spreadsheet data, however, is a problem — Presentation Team doesn't do it. That is, it doesn't import ASCII or 1-2-3 files, so that's almost the same as not doing it.

On the slide

The slide show is rather disappointing... well, not *disappointing*, just as bad as expected. In order to view a slide show, the printer device has to be set up as a VGA screen (or whatever type you have), then the file is printed to the screen. There are no transitional effects from one slide to another during an on-screen slide show. There is a slide sorter, for rearranging, copying and deleting

slides, but this is purely text based: there is no thumbnail view of the slides.

When you have designed your slides, you'll probably bypass the limited slide show facilities and get them put onto 35mm slides or OHP sheets. Frankly, you'd be better off going back to coloured pens and an A4 notepad — it's a lot cheaper and the results aren't that different. However, if you do want a hardcopy of your work there is a device driver which can 'print' the files to disk in a format accepted by Edigraphics, a slide bureau. Files can be sent by modem, using the software provided, but you must phone them first to receive a 'starter pack'.

For the price, I expect a lot more from a presentation graphics package. Presentation Team is vastly overpriced and equally underpowered. It is the only package in this Group Test that is not capable of producing the goods.

Mat Beard

Lotus Freelance Graphics 4.0



Freelance was originally a program for spreadsheet presentation and it shows: there is still a dry, statistical feel to it, despite its technical competence. The problem is also partly due to this version being a DOS version. The new Windows version is apparently much better (see page 287).

Version 4.0 for DOS runs on an XT or AT level computer, running DOS 3.0 or higher. The program and font files require 5.2Mb disk space, with a further 2.8Mb for symbols, sample charts and

Freelance Graphics 4.0

Supplier

Lotus Development (0784) 455445

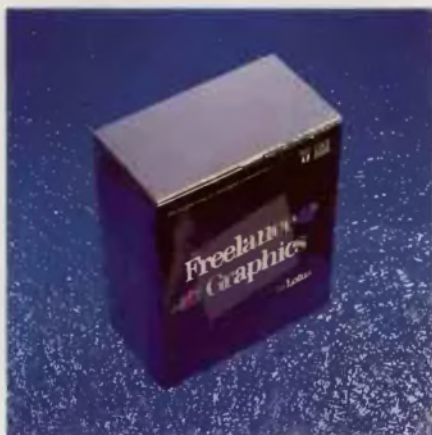
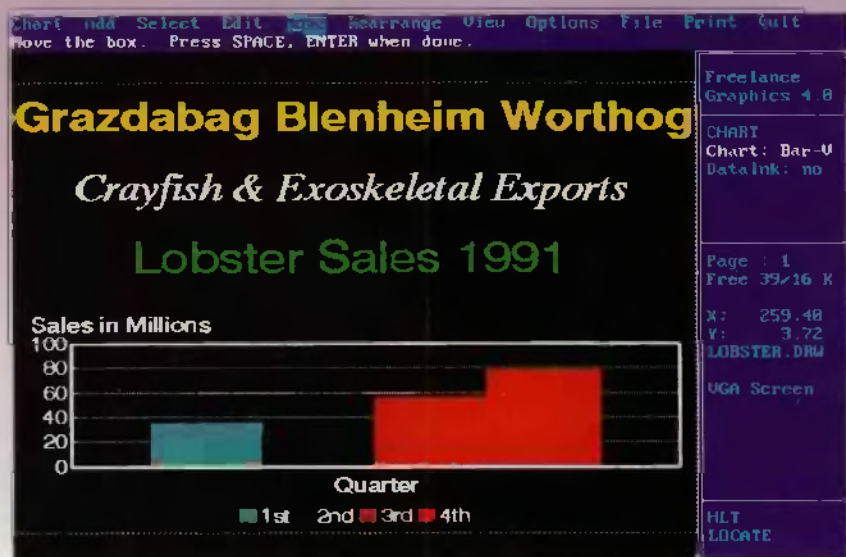
Price

£395

Good Points Now available for Windows.

Bad Points Ugly, difficult to use.

Conclusion Fine for fans of Lotus, but not for the easily scared.



tutorial files. A Symantec outliner and text manipulator, called GrandView LT, was also supplied and took up a further 670K disk space.

Everything is held on thirteen 3.5in floppy disks. Installation of the main program was relatively simple, but the symbols and chart gallery have to be copied to the hard disk using DOS. It was also somewhat unusual that either all or none of the files are copied. Although they only occupy 2.8Mb of memory, it's unnecessary to force the tutorial files on everyone who wants the chart gallery.

Not for the fainthearted

Like the installation, learning to use Freelance can be a frightening task and is not for the fainthearted. It helps to have used other Lotus software, as the menu structures are similar. Otherwise, it is not an intuitive program, and can be discouraging when, even after the second or third attempt at a presentation, the results are abysmal.

The process of creating a presentation is split into three sections. In the

first section, the slides, or pages, of the presentation are created. Then, the Portfolio option arranges them into the format of a presentation, and finally, Screen Show controls the flow of slides to whatever output device is being used.

Nightmare

Most work will be started in the Creating Charts and Drawings section, and it is here that the sheer number of possibilities can be daunting to the newcomer. Decide to create a chart and you are immediately faced with a complex form, running to three pages, that will stir nightmares of the dole office or the Inland Revenue. All the details have to be entered here: headings, titles, the chart type, colours, type of axes and grid intervals and even the chart location. Pages two and three of this form are dependent on your choice of chart. Thankfully, unlike the claim forms, pop-up menus give a choice of answers for the more difficult questions.

At the bar

Thirteen chart types are possible with Freelance, incorporating a standard table and bulleted text list. Both horizontal and vertical bar charts are included. The bars can be plain or 'stacked', where different coloured sections of a bar show different variables. Bars can also be produced in 3D, and in conjunction with a line graph. Simple line graphs and scatter graphs, as well as the high-low-close-open graphs popular on the stock market, are possible, and Freelance will also produce a 'filled' line graph where the area under the curve is filled with colour.

Once added to the page, the chart can still be adjusted and text and draw-

ings added over it and around it. Mouse control is supported but it is not always intuitive; and, somewhat inconveniently, techniques for mouse control are not given on the screen, just the keyboard commands, and are not even at the appropriate section in the main reference book. Instead, the user is continually told to refer to the *Quick Reference* or *Smart Start* booklets.

Patience

Creating the drawings also calls for a fair degree of patience and perseverance. The tools for creating figures cover line drawing, circles, arcs, rectangles, polygons, slices and arrows and a freehand tool covers pretty much anything that these won't produce. As each is selected, a submenu appears on the menu bar, with basic instructions underneath. Unfortunately, those instructions really are basic and act more as a memory-jogger than as reference. The manual is essential, at least for the first few minutes — try to guess how the drawing tools work and you're invariably wrong.

Text is added through the same 'Add' menu and suffers many of the same confusions. Text is entered in single lines, up to 80 characters in length each, which are then placed in position on the page. There is no way of entering directly onto the screen, even though the text may be just two to three words long. The typestyle can be changed once the text has been placed on the page and the phrase resized and moved on the page.

GrandView LT

GrandView LT has been included in the bundle to give Freelance better text editing facilities. With this program

installed, a spell-check can be run and word processing functions like search and replace and cut and paste can be performed.

When all the separate pictures for the slide show have been created, the Portfolio option puts them in order. The first thing users are faced with is another form. Here, a list of the slides is entered in order, up to 100 slides. As well as the file name and file path of each slide, there is room to enter a few details such as Company Logo, Sales Chart - February, or List of Employee Benefits. A Preview command shows how each page will look when printed and View mode gives a draft version of the page when Preview mode is too slow.

With the Screen Show, these presentations are set up to run to an output device, playing through the slides in any number of ways. One screen can fade into the next, or wipe across it. The next slide can weave into the old one, or drip into it by replacing it one scanned line at a time, or spiral over the top in a circular motion. Another slide can move into a box on top of the screen before it, at either half the size of the previous screen or a quarter.

Staying power

There are enormous possibilities for creating professional displays, and that is no doubt what made Freelance Graphics one of the most popular presentation packages on the market. However, it needs a little staying power on the user's part before the results start to show.

From the reviews to date, it would seem that the Windows version is more accessible and I would want to see that

version before investing in Freelance.

Helen Johnstone

Lotus Freelance Graphics for Windows



Lotus, like IBM, is showing signs of fading glory. Both organisations seem to share an obsession with the past, and an inability to translate last year's marketing winovers into this year's happy recipients of innovation. Freelance for Windows carries over a name from a notorious resource hog of the DOS world; the questions have to be whether the leap to a new standard has shaken off the porcine tendencies, and shown a regard for the future rather than concern for the past.

I handed the Freelance disks to my boss, having read the installation guide: I did this because his machine had more room on it than mine. He went

away, went very quiet for some time, and came back to say 'My word, but that's a *fat* little program.'

That was why he had the disks: I had seen that the install procedure asks for a full 10Mb of disk space. Cheerily enough, it allows the possibility of chucking stuff away to release some room back to you, but only once all 10Mb has gone on the disk. You must chuck away some of your other software first, if space is short, and as Freelance takes up 10Mb, 'short' is a relative concept. Unlike 1-2-3 for Windows, Freelance isn't copy protected.

Stage fright

The first time you run Freelance you're plunged into an enforced and lengthy tutorial-cum-marketing spiel. This, more than any other part of the product, sets the stage and declares the audience for Freelance. It portrays the world of the double-breasted suit, and of people called to present who view the activity with utter panic. Freelance, it suggests, is just the right tool to take away those presentation blues.

At first glance, indeed it is. The helping hand of Lotus leads the way, making it easy and even entertaining to get into the formulated swing of presenting: a very large proportion of that 10Mb is taken up by clip art and SmartMaster templates. These are essentially pre-designed presentations, complete with text objects upon which you merely have to click and type.

For the declared target market, this must come as an epic relief. For those more inclined to roll their own layouts, every facility currently held to be indispensable is included. There's a large and capable integrated graphing util-

Freelance Graphics for Windows

Supplier

Lotus Development (0784) 455445

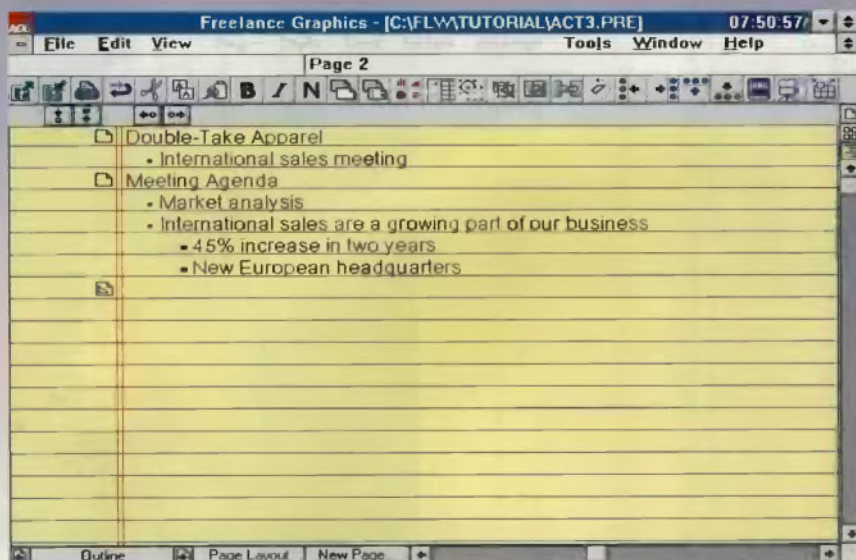
Price

£445

Good Points Easy to use, fully featured.

Bad Points Painfully kitsch clip art takes up most of the room. No facility for Excel chart.

Conclusion Technically capable product, marred by huge size of package and downright annoying error message system.



ity, with a medium-wide range of formats for imported data: most prominent among these is of course the 1-2-3 file standards, and most evidently missing are either Chart or Worksheet formats from Excel.

Your slides are viewable via an outliner view, with the title of each slide serving as a heading, or in a slide sorter, more or less a standard feature in presentation systems worth their salt. Both these features allow the components of a presentation to be viewed at a slight remove, so that the oratorical and visual structure — the sense of what you are saying — can be given some consideration. It's surprising how all but the simplest standup talk benefits from examination in this way, and the presence of this mechanism separates the men from the boys in Presentation Graphics programs.

Slant on Lotus

The usual facilities for placing imported graphics, with a slant on the available formats being from Lotus products, are provided: create a rectangle to hold the file and import to it. The first time I tried this I happened to be sitting on the master layout page, the template from which all the rest of the slides are built, and I got an error dialog. I wasn't allowed to do that, it seemed; instead, I should have another go when located on a Slide, rather than the master.

It has always seemed to me that a large part of the whole Graphic User Interface movement was the stamping out of error messages of all kinds: if it was a mistake to do something while in a particular place, or at a particular stage, then the menu entry is greyed out, or the mouse won't change shape,

or something similar. Further investigation then shows what's being done wrong. This rigorous approach delivered easy to use and cleverly designed systems almost as a side-effect; for developers, it injects an immediate dose of embarrassment at the first pass of the user testing phase.

Freelance, however, is peppered with error dialogs which arise because options are not greyed out when they are irrelevant or unsuitable. This does not seem like an advance from the days of the character mode program. But of course, it wasn't that long ago that various Lotus pronouncements were suggesting that Windows wasn't an advance.

Then there's the SmartIcons palette. This is Lotus' great contribution to what the company considers no step forward at all: either a bar or a floating tear-off rectangular menu of small iconic buttons. Each button performs a task, and operates as an alternative to choosing a menu item or hitting a keychord. I first saw this interface convention in a product called Flair Paint for the Atari ST, and it was rather nice then. It's still nice now, providing the maximum workspace and flexibility while allowing you to get on and access the features you need the most.

The horror...

My last reservation has nothing to do with the technical abilities of the system, but with the supplied libraries of images and SmartMaster presentation templates. The theory behind these things is that they take away the horror of discovering that you have no talent as a graphic designer — and it is a horror, if someone has told you to pro-

duce something which is nice to look at. However, the choices made by the people at Lotus are open to some highly unfortunate interpretations. I wonder how many presentation tyros will trip off to Belgium, to try to close that sale with some Low Country clients, only to find them laughing helplessly at BENELUX.SYM which contains some shockingly twee images of that country. I wonder how many Americans take their copy of Freelance for Windows and find a BRITAIN.SYM which contains a London taxi, and stereotypes of Maggie Thatcher and Charles & Di?

Having removed the agony of choice, it seems to me that Freelance exposes the agony of alienating people who do not share the entirely mainstream aesthetic sensibilities and smug security of the double-breasted office world. Perhaps the lesson is that there is no real sinecure for the agonies of presentation, except to learn how to do it properly.

Steve Cassidy

Micrografx Charisma 2.1

Micrografx has a reputation for high quality (and high cost) graphics design packages. The company is also something of a Windows old boy, having written its first apps back in the bad old v2.0 days. No from-the-ground-up rewrites here — Charisma v2.1 is a stable descendant from an old and faithful line.

Mind you, many Windows companies (including Microsoft) have dragged their feet over releasing updates that take advantage of Windows 3.0's new

Charisma 2.1

Supplier

Micrografx (0483) 747526

Price

£395

Good Points Extensive and easy to use.

Very Windows aware.

Bad Points Expensive, with 'value added features' that add nothing but costs.

Conclusion The best of its type.



Common cold virus: Biocentrum/Science Photo Library

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features. This new version of Charisma exploits them to the full, starting with the frivolous new fashion for cut-steel dialog boxes and 3D buttons in the installation program. Very trendy — but you can still expect to spend a good portion of an hour unpacking the eleven 3.5in disks.

The main program itself smacks of a full-blown object-based designer with chart and graph extensions. The package includes all the usual charting features, with additions for word charts (a number of templates are supplied) and linear, exponential and logarithmic regression analysis. Worksheets, the spreadsheet-like entry forms for data, can be 16384 x 256 columns. Data entry is OK within Charisma, but it's easier to import. Information can be mined from 1-2-3, Excel, Quattro Pro, Harvard and xBASE derivatives.

Page construction

Presentations are made from pages which are constructed from graphical objects — either from clip-art files, or made up from the toolbox of text, rectangles, arcs, polygons and curves. Graphs are selected using a dialog, and then pasted into the page as grouped collections of the above. They can be broken down into their constituent parts and treated as separate objects, but they also retain some integrity as graphs, too: an auto-update facility allows the graph to keep track of changes in the data, altered manually or through DDE hot-links. Object manipulation is fairly extensive: objects, or groups of objects can be stretched, rotated, flipped and aligned together. Flash-Harry graph effects include 3D, line smoothing, hi-lo lines, drop lines and stacking.

When we reviewed business graphics packages in November 1990, our reviewer noted (rightly, at the time) that Charisma's interface was daunting to enter cold. The most confusing of those features then, the user-definable button bar, has now become one of the mainstream Windows gadgets and so

hopefully will have lost some of its fear to the casual user. The interface for moving around the screen and editing individual elements is simple to pick up for the Windows-savvy user, and now uses the GUI to hide the complexity of the application well.

Little extras

Many of Charisma's best points are just intelligent exploitations of Windows features, but even these have little extras peppered around them — Charisma's nimble home-brew PostScript and Colour PostScript drivers, for example.

Micrografx chugs along in relative Windows terms, which isn't surprising given that the Micrografx development crew once spent two years of developer time taking Windows apart to construct an OS/2 Windows emulator. It's a big program, however, and can tar up on smaller machines. Don't expect to run it without finger-drumming on a 286, or even a 16MHz 386.

On the other hand, the worst bugbear of business graphics on slow machines, redraws, seem to have been dealt with quite well. Redraws are usually a pain in complex, object-based packages because either the package stops for no man as it reconstructs your 1500-element scattergraphs, or redraws so rarely that divots of previous objects hang around for whole sessions. Charisma stops a redraw for anything, and rarely dumps a messy blunder. I seldom had to use the manual 'clean-up' option.

Charisma takes good advantage of Windows colour. 256-colour modes are supported, with graduated screen backgrounds now genuinely approximate to that gentle blending one sees in slide shots.

Multiple palettes

Colour support in the package itself is extensive but obscure. It caters for multiple palettes (including a Pantone one), and allows customisation by CMYK, HLS and RGB, but working out exactly what's changing, and to what, isn't easy. The manual struggles a little too. Explaining it all takes up 50 pages of the *Reference Guide*, and you will need to refer to it to get things working. This contrasts sharply with the rest of the interface, which manages to hide the overpowering complexity of the package quite effectively. Definitely the weak point of the interface, if not the functionality of the package.

The manuals come in two parts. The shorter *Learning Guide* takes the usual narratory approach, with worked examples of word charts, data charts, logos and presentations. It concentrates on

teaching the interface, rather than drowning the novice in features, which is fair enough, but possibly a little frustrating after 250 pages or so. The *Reference Guide* isn't quite, as it still expects one to read through it from start to finish. Both are clear, and helped out with excellent indexes and glossaries. A thumbnail index to the clip art is included.

Drowning in clip art

Clip art. Far too much clip art. *Vast piles* of clip art. The 2200 business symbols that are currently drowning my hard disk include skeletons, American presidents and what appears to be the 'Sports-For-All' ideogram for Rabbi. Fun but exceedingly optional extras.

Fonts are Bitstream and URW Nimbus-Q. Micrografx claims that 41 fonts are included, but counts italics, bold, and regular separately so make that more like 15. Nonetheless they're a respectable batch, including Garamond, Swiss and a pleasant cursive called Vivaldi. ATM Fonts are now supported. There's also a very impressive facility to convert fonts to outlines; breaking them down into their component curves, which can then be messed around with using the standard edit tools.

That's not a feature generally found outside dedicated design packages like Corel Draw. Another capability worth mentioning in passing — although as yet, still untested — is Charisma's OLE support. Curiously, it advertises itself to other applications as an OLE.

Scoring a hat-trick

Charisma v2.1 is the first presentation package I've seen to pull off the much demanded Windows hat-trick of speed, utility and intuitive control. You pay the price for that, of course, plus the price of many extras you will certainly never need. But if you do have the cash, this is a product that should suit any of your requirements.

Dan O'Brien

Microsoft PowerPoint 2.0 for Windows

Microsoft has been doing well recently, with Word for Windows 2.0, Excel 3.0 and Visual Basic picking up four prizes at the recent PCW Awards. With this in mind, I was expecting great things from PowerPoint for Windows.

As usual, the disks were accompanied by the main user's manual, plus a variety of smaller pamphlets explain-

PowerPoint 2.0 for Windows

Supplier

Microsoft (0734) 271000

Price

£495

Good Points Excellent use of colour.

Bad Points Lacks important features.

Conclusion Quick and easy to use, but no award winner.



ing the installation procedure, use of templates and so on. The installation procedure is simple and, not surprisingly, Windows-based. The setup program first checks your hard disk to see if you have enough space; if not, you have the option of quitting the installation and making some space or not installing some unessential files. To fully install PowerPoint you will need just over 7.5Mb, quite a considerable amount but nothing compared to Harvard Graphics for Windows. I installed the whole thing — fortunately I'm not short of disk space.

Once installed, the PowerPoint and GraphicsLink (of which more later) icons are added to a PowerPoint window. Loading the package took approximately ten seconds on a 33MHz 486, so you may be looking at around half a minute on a slower machine, but even that would be fast compared to some packages (Hollywood, for example).

Uninviting introduction

The opening screen is far from inviting — completely white with 'Title' writ-

ten in the middle. This can be altered or left blank but cannot be deleted completely. To the left of the screen is a toolbox and a slider. The toolbox contains four drawing tools, labelling and word processing tools and a pointer for selecting objects. There are no tools for skewing, rotating or flipping objects and there is no way of doing this via the menus either. In fact, there is no way of doing anything fancy at all. You can't have vertical text or alter the perspective of text, features quite common in other packages.

The slider is used for moving between slides in a presentation. This can be done in two ways: either by clicking on the arrows at the top and bottom, or by dragging the slider to the desired position.

PowerPoint comes into its own when you need to produce something that looks good, quickly. A wide range of templates is provided, for 35mm colour slides (which can also be used for on-screen presentations) and black and white overheads. The accompanying pamphlet shows what all the templates look like, so you don't have to load each one to see them. There are over 400 colour clip art pictures that can help add a little sparkle to otherwise 'flat' presentations.

Paste From command

The Paste From command is very useful. It allows a picture or image that has been produced in a different package and saved to disk to be imported into the slide. Files of various formats can be inserted in this way: .PIC, .CGM, .TIF, .EPS, .PCX, Microsoft Paint, bitmaps (.BMP), device independent bitmaps (.DIB) and Windows .WMF are

all supported. Once into PowerPoint these images can be resized and recoloured (with 256-colour images only the first 64 colours can be altered).

The Paste From command can also be used for importing text from other word processors in either ASCII or RTF formats. If you're using a Windows-based word processor, text can be cut and pasted into PowerPoint's word processor using the normal Edit menu commands.

PowerPoint has the best colour implementation of all the packages I have seen. When the background and foreground colours have been chosen, from a palette of 16.8 million, you are given a choice of several colour schemes that automatically balance your background. You aren't limited to these colours, but they are easily accessible and generally look good.

The presentation managing capabilities are excellent, speaker's notes and audience handouts being produced automatically. A WYSIWYG preview of all the slides in a presentation can be used to rearrange the slides by dragging them to another position, or even deleting and copying entire slides.

The on-screen slide show, however, is a bit of a let-down. There are no special effects while transferring from one slide to the next, such as fade or 'screen wipe', and there is no option for producing a 'run-time' show to run on a remote computer that doesn't have PowerPoint.

PowerPoint lacks some important features, such as the ability to automatically create bulleted charts: they can be done, but the procedure is far from automatic. There is no facility for producing organisational charts either.



PowerPoint for the Mac

Supplier

Microsoft (0734) 271000

Price

£275

Good Points Colour implementation. Supports System 7's TrueType Fonts and appears System 7 compatible (vs System 7 savvy).

Bad Points No outliner. Not System 7 savvy.

Conclusion Good; and with a little work, could be great.



I suppose they *could* be done, but only in the same way as in Windows Paintbrush — that is, with difficulty. The charting abilities leave a lot to be desired too, and you would do better turning to Excel or even Word for Windows 2.0.

Cheap-looking charts

If you are forced to use the PowerPoint Graph, you can import data in a variety of formats including Lotus 1-2-3 and Symphony, Microsoft Excel, Works, MultiPlan and ASCII. The current chart is displayed alongside the datasheet and any changes are updated immediately. The data can be displayed in a number of ways, from area charts to pie charts, but they look as though they have been produced on a very cheap spreadsheet.

The other icon that appears in the Program Manager is the GENI GraphicsLink. This is a communications package that can be used to send files to Genigraphics, where they are made into 35mm colour slides, overheads or prints. This service isn't free, but the phone call is. Before sending, the files are 'printed' to disk using the Genigraphics driver, which presumably compresses them to reduce transmission time.

Quality with ease

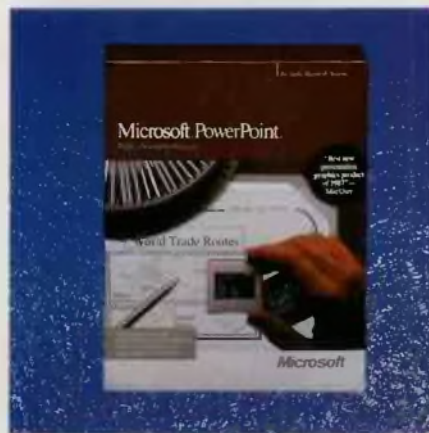
PowerPoint is powerful, capable of producing professional results. It is worth spending half an hour going through the tutorial: it's a fine example of something Christopher Columbus might have given the Queen of Spain, had he access to a PC and PowerPoint. You are guided through all the features of the package, and you should then be able to

produce flash-looking presentations.

Most of the packages in this test are capable of producing virtually the same output. The measure of a package's quality is the ease with which it can be done and it is here where PowerPoint scores highly.

Mat Beard

Microsoft PowerPoint for the Mac



Living VideoText's MORE 1.0 first titillated presenters with its ability to create basic bullet and line/block charts, and Forethought's PowerPoint with its dedicated slide tools transformed presentation software into an established niche.

Since those early days, Symantec acquired MORE and transformed it into an outlining/presentation powerhouse, while Microsoft acquired PowerPoint and added colour. That's not to argue

that Microsoft has been somehow deficient in pushing PowerPoint's evolution. The program remains a popular presentation tool, but it must be evaluated in light of the competition and the evolving Mac interface.

One of the problems with creating a professional presentation is collecting pieces of disparate information, formatting attractive and interesting slides, and maintaining continuity from slide to slide. The latter concerns choice and order of subject matter, and also involves style and formatting.

Graphic miniatures

Choice and order of subject matter serves as the logical backbone of a presentation and PowerPoint lacks the basic outlining tools required to view and modify a presentation structure. For short presentations, however, its slide sorter shows graphic miniatures of each slide which can be click-dragged to change their order. To help maintain a constant feel or format, PowerPoint includes the option to create a slide master which then serves as a model upon which all slides are based. The master can be altered at any time and all changes are immediately reflected throughout the whole presentation.

Similar to the Slide Master, the Notes Master allows text or graphics to be inserted universally. PowerPoint makes it a simple matter to associate a notes page with each slide. Each notes page includes a miniaturised version of the corresponding slide at the top of a page and the user can access the PowerPoint word processor as well as all the slide creation drawing tools. The program also lets you print audience 'handouts' of up to six slides per page to accom-

pany a briefing.

PowerPoint includes a word processor designed to facilitate the creation of bullet charts and tables. This tool is available in both Slide and Notes mode (Master or Individual) and can be accessed regardless of slide size. A text ruler with five indents gives you control over leading lines and body text by employing a clever system of draggable indent icons. Regular tabs and decimal tabs can be set, and the ruler represents true inches independent of view or window size.

Style editor

PowerPoint includes a rudimentary style editor and lets you assign default font, size, and style, but revising a presentation can be tedious. Text and graphics not on the master slide must be individually manipulated for each slide. Changing a style definition does not automatically alter existing text blocks. Drawing tools include line, oval, rounded rectangle, and rectangle icons which can be used in either slide view or notes view. Delimiter key combinations can be used in conjunction with these tools to generate vertical, horizontal, and 45 degree lines, perfect circles or squares, or to draw from the centre. Permanently attached labels can be entered, frames attached and drop shadow applied. A variety of line thicknesses and styles is available including generating arrows for emphasis.

In creating slides the user can incorporate graphics from the scrapbook or clipboard or can paste them in directly from any MacPaint or MacDraw formatted data file. All graphics imported to PowerPoint become and are manipulated as objects.

PowerPoint includes a hierarchical colour selection process that lets you select a background colour and then displays a set of foreground colours that fit well with your choice. After you make a choice of foreground colour, the program goes on to display palettes of compatible accent colours for assigning to text, lines, fills, and so on. Thus, even if you're not an artist, PowerPoint ensures that your colour schemes work together. The program includes colour schemes selected by professional artists at Geniographics as particularly recommended for use in video, on-screen presentations, and 35mm slides, and PowerPoint presentations can be sent to Geniographics dealers for professional processing.

Output

One of the crucial decisions in preparing a presentation is determining the medium that will be used to show the slides. PowerPoint is capable of automatically formatting slides for overhead transparencies, 35mm photographic slides, flip charts, and on-screen presentations. The user can select an option that will allow virtually any customised screen layout. Note that although the program will generate slides appropriately sized for transparency or 35mm slide production, additional hardware is required to make the actual transfer to these mediums.

The documentation includes an extensive 'Quick Tour' which takes the user step by step through the design and creation of a slide-show presentation and which references a presentation file included on the library disk. More detailed advice and suggestions are provided in a 'Using PowerPoint'

section and experienced users can get information quickly from the 'PowerPointReference' pages. For those needing advice on the preparation of effective presentations, a separate 45-page guide is provided. Overall, the documentation is well written, concise, and aptly illustrated.

An on-line help file is included appropriately as an 83-frame PowerPoint presentation. The help slides take full advantage of PowerPoint's graphics and text capabilities and the help presentation can be customised to meet your own circumstances.

Aimlessly adrift

Forethought's original PowerPoint interface remains compelling. Colour features are well conceived, even brilliant. The program lacks some of the basic features like outlining, global formatting, and graph generation that we now associate with presentation software and is further limited by its failure to fully support System 7. It's a shame to let software with so much potential drift aimlessly.

Mick O'Neil

SPC Harvard Graphics for Windows



Here is a program with lots of expectations to live up to. Its Harvard Graphics DOS 'ancestor' is one of the best (if not the best) presentation graphics programs around, so there will be two distinct camps of users with an eye on Harvard Graphics for Windows.

Harvard Graphics for Windows

Supplier

SPC UK (0344) 867100

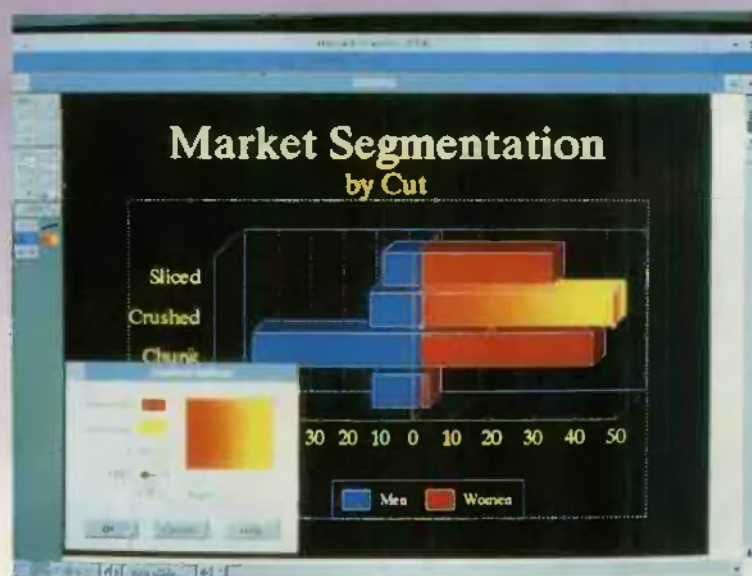
Price

£445

Good Points Easy to use, good-looking interface.

Bad Points Oh so slow.

Conclusion Good effort, shame about the hardware.





The first are existing DOS users, the second are Windows users looking to buy a presentation graphics program. The first group should stay put — or upgrade to version 3 — and forget this Windows version. The second group might find more to their liking here.

Shifting such a mature product from DOS to Windows is not always successful, not least because of the processing overhead Windows inevitably adds to any such package. In this case, SPC has done a reasonable job of maintaining features, though not without sacrifice. The result is a product which captures most of the power of the DOS version, but at a performance cost.

Dubious description

It has been described as an 'upgrade' from Harvard Graphics 3. This is rather dubious: if anything this is a downgrade. It has a few advantages over the DOS version: for example, file linking is marginally easier through the DDE (although the DOS version includes links to external data files).

Not all functions have been moved over from the DOS platform — the Evolve tool, for example, is missing. Perhaps a small loss, but any advantages of the Windows implementation over its DOS inspiration seem to me to be outweighed by the package's overall slowness.

The problem was not my hardware. Although I can no longer claim to be running a real 'power PC', the review machine was an Elonex 386, running at 20MHz, with a recently (the day before) defragmented 28m/sec hard disk. A program that demands far greater computational resource than this is not a general purpose office product.

Harvard Graphics for Windows opens with three menu options — File, Window and Help. File offers New Presentation, or other file management options. New Presentation brings up a dialog box to add a slide to the show, from which you select from the 12 standard slide types — organisation,

Presentation Graphics: putting on a professional face

Presentation Graphics software falls into two main categories: GUI or text based. Put another way, they fall into three groups: DOS, Windows and Mac. The packages in all three groups proved, on the whole, to be powerful, competent and big, *very big*. Some are bigger than others, but more importantly, some are more competent than others.

For DOS-based users, the move to Windows would offer clear advantages on the presentation graphics front. Generally, the GUI interface proves to be a better environment for such packages, all the slides for a presentation being kept in a single file and producing better output results. Windows has its disadvantages though; you'll need an above average machine (at least a 386 with 4Mb of RAM) to run it properly and the software is usually expensive.

The alternative is very clear cut: if you don't want to switch to Windows, then use **Harvard Graphics 3.0** which wins our **Seal of Approval**. It is by far the best DOS-based package available, offering most of the features of the best Windows programs — and it's easy

to use, too.

If you are already a Windows user, then take a look at **Harvard Graphics for Windows (Shortlist)**, **Freelance Graphics (Shortlist)** or **Aldus Persuasion (Seal of Approval)**; there's not much between them and they are all excellent.

That's not to say that **Hollywood** and **PowerPoint** wouldn't do the job: they wouldn't do it as quickly or as easily, but they're not far behind. Persuasion offers the advantage of having a sister program for the Macintosh — very useful in offices such as ours at PCW where we use both PCs and Macs.

On the Mac side, if it's speed you're after then go for **Symantec's MORE**. Turning an outline into an impressive-looking chart can be done instantly at the click of a mouse button. But if you want real flair, then it has to be **Persuasion (Seal of Approval)**. With no competition from Lotus or SPC it is the best presentation graphics package available for the Mac.

Oh, I forgot about GEM. Well, in a one-horse race there can be only one winner: well done Digital Research — **Presentation Team** is the best GEM package.

drawings, tables, pies and so on. Here you can pull up the chart gallery, which is valuable and well implemented, and in fact offers more to choose from than the DOS version.

File compatibility is maintained with earlier versions, though this is imperfect, and not all elements of a presentation will translate exactly. The time taken to load just one DOS version 3 image took just under 2.5 minutes, compared to just under a minute to load a single HGW format graphic. Hardly snappy performance.

Related views

Harvard offers three related views of the presentation, and four presentations can be open simultaneously. The Slide Editor is the graphical workplace, akin to the 'draw' screen in the DOS version. The Outliner offers an overall approach to slide construction which is simple, and not unlike Aldus' Persuasion. Much of the work can be done in text mode in the outliner and the slide masters applied to the text.

A good feature is the Slide Sorter, which lets you have all your slides presented on screen as a batch of small slides. Here too, screen drawing times are a pain. Slide sequences can be rearranged here, and you can jump to the Slide Editor view of any slide by pointing to the appropriate icon.

As in its DOS relative, Harvard allows the addition of buttons to slides, to cause jumps to other slides — or even to launch other applications. This does not use Windows Object Linking and Embedding (OLE) but brings the benefit of enabling DOS applications to be launched this way.

A thorough toolset is included, with a typical range of graphical objects — circles, ellipses, rectangles and so on. A zoom feature is provided, which can take you a long way in. The colour palette editor is well implemented. Various colours and a 'mixing' palette are on offer, enabling a wide range of tones to be constructed by pointing to a suitable hue and pushing a tone slider back and forth.

Twiddling thumbs

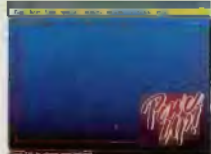
Screen redraw times can be a nuisance when working on complex slides. If you have busy graphics on screen, unlike the DOS version, redrawing cannot be interrupted simply by clicking the right-hand mouse button. You can almost get on with other tasks, and the system will interrupt the redraw to note your clicking at a menu, but it is not immediate and leaves you unsure as to whether it has really understood. This makes for irritating thumb twiddling or confusion while the package chugs through its repeated screen

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Slide Sorter - acts as a lightbox, showing miniature representations of all your charts on screen so you can easily arrange and modify your presentations.

WYSIWYG text and drawing tools - that act directly on your charts, so there's no guesswork.

Professional fonts and art - including eight top quality fonts and 400 clip art images, for maximum visual impact.



You know the scenario - presentation scheduled for Wednesday morning, and you're still working on it on Monday night. Getting the content right is usually the hard part, illustrating it should be easy, but often isn't. Why? Because the software that came with your PC won't do what you want. Or that fancy presentation programme sitting on the shelf is so complicated you need a day just to re-learn it! The alternative - a bill for a lot more than £150 from an outside supplier to do it for you.

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Express Presenter requires 640K of memory, DOS 3.0 or later, VGA, EGA, CGA, or Hercules graphics, a hard disk, and a Microsoft compatible mouse.

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Surrey GU16 6EZ

machinations yet again just because you changed something.

The Windows-based installation routine is acceptable. It lacks a display to track the disk space requirements as installation options are checked. This is a pity, as the full package needs 14Mb of disk space — not everyone has that much to spare. The minimum installation swallows 8Mb. It allows you *not* to load the default 'style', which can cause problems when loading one of the example files. A warning (since the program seems unable to manage with the next best style) would have helped.

Modest minimum hardware requirements are stated — a 286 with 2Mb of RAM. In practice, running this program on anything other than a true 'power PC' will cause frustration. The manual suggests a 386 with 4Mb of RAM: I suspect it needs more.

Emasculated package

Windows users who know no better will be more than satisfied by this package. If you already use Harvard Graphics Version 3, however, do not be tempted to change to this unless you have an absolutely unavoidable instruction from your boss to standardise on Windows products. Otherwise, you will be irked by the performance and long for the days when you had the far snappier DOS version.

Harvard Graphics for Windows is not a *bad* program — far from it. As Windows graphics packages go, this one stands up well alongside the competition. It is merely that what was a truly powerful package has been sadly emasculated to squash it through a Window.

Nick Beard

SPC Harvard Graphics 3.0



Market leader in graphics programs, Software Publishing Corporation (SPC) has consolidated its position as leader of the presentation pack with this most recent release of Harvard Graphics. The success of HG over the years has helped SPC to grow into one of the largest software companies in the world. It doubtless also helped to finance the acquisition of fully formed and fully fledged Windows database and word processing packages: Precision Software's SuperBase IV and what was then Samna's Ami Pro, anticipating Lotus who later purchased the name as well as the product. (I still don't fully understand the software industry: the same program sold to two different people, rebadged and resold as two separate products? Why not? People do

it with hardware...)

HG3 is a powerful DOS product that laughs at Windows offerings, though there is a Windows version too, re-potted especially for Windows seductees.)

The opening work screen, which follows a full screen marble-effect corporate boast, is a dull and work-person-like drop-down menu affair which offers Create Chart, Edit Chart (which requires a file to be loaded first...), Draw plus a few file, print and general housekeeping options. Create creates the next menu, offering various charts, drawings and the gallery. Data for graphs can be typed into the easy-to-use 'form', or imported from a spreadsheet.

Dream feature

File linking is available to ensure that repeated slides are up to date. The organisational chart feature is a dream to use: so simple. Slides created with either option can be dropped into Draw for amendment or addition of other graphical objects. Gallery offers a point-and-shoot selection of pro-forma slides.

There is a wide range of drawing, editing and text effect features on offer. One of the less common of these is Evolve, which calculates intermediate objects between two specified shapes. This works most obviously well with simple geometric shapes, and does a good job of squaring the circle. It will generally manage to find fairly convincing evolutionary steps for the transition between fish and executives too. The Evolve effect works well on text too, and can be set to 'delete' previous steps to give the impression of animation during PC shows.

HG scores well against the competi-

Harvard Graphics 3.0

Supplier

SPC UK (0344) 867100

Price

£445

Good Points Potent and mature. Does everything.

Bad Points None.

Conclusion Laughs at Windows. The best.



tion on pure features checklists, so in terms of straight power it will not let you down. If you want it, it is almost certainly here. There is more to this, though, than just features — it is well thought out and attractive to use. There are a few oddities that require some 'acclimatisation' time, not least the mouse button effects which can cause a good bit of unwanted clickery in the early days of using the thing.

A wide range of output devices and formats is supported. Additional facilities are included to aid PC-based shows, such as the 'hypershow' facility that adds interactive 'buttons' to slides which prompt jumps to other slides when 'pressed.'

Professional what?

The first export format offered is Professional Write, which made me wince. *Professional Write? Are they serious?* Sure, products have to bang their own corporate trumpets and all that, but this particular package? Imagine my surprise when I read that Professional Write is the fourth biggest selling word processing package in the world. There's more: in the US (which even the most neanderthal nationalist would have to accept is a more important software market than here) it has supposedly captured some 70% of the managerial market. You learn something new every day...

Other formats on offer, more obviously, are CGM Metafiles, PostScript, HPGL plotter files, and .PCX. The import range is good too, recognising Excel and Lotus charts and data, dBase and CGM.

On-line help, while terse, is context sensitive and effective. The package is

generally easy enough to use to require little help. Documentation is good, with a few small and short guides to getting started, upgrading and the clip art set in addition to the effective and detailed *User Guide*. You can produce striking presentations within HG without recourse to any of these instructions — though as with any complicated bit of equipment, there are clearly benefits to learning its finer points.

A screen grabber is included which will happily take PCX images of other programs, for incorporation into HG or to anything else that knows about PiCture eXchanging.

Shelling out

Shelling out to DOS is easy, and HG carefully shrinks down to leave enough memory to do useful work; this review is being written in WordPerfect running in the Harvard Graphics DOS shell, and even then I have space to shell out of WordPerfect to run Xtree. There is also a print spooler, which means you can be doing useful work as the program thinks about a heavy graphics print. This is more than can be said for some Windows packages. (Can someone please tell me why a supposedly multi-tasking operating system still cannot print properly in the background?)

Harvard requires at least a 286, with a minimum of 640K of memory, at least 438K of which must be available to HG. To install the full program plus gallery and clip art, soft fonts and the rest of the works takes up over 10Mb of hard disk — not outrageous these days, especially for such a powerful tool. The program is LAN compatible and comes ready to run on a network.

Presentation builder

Maybe if I had a very fast 486 and a very fast hard disk I might regularly and reliably use a Windows environment to produce work. Perhaps then I would not have to twiddle my thumbs between mouse strokes. Until then, serious work will continue to be done under DOS, and Harvard will be there when I am building presentations.

Nick Beard

Symantec MORE 3.0



From the moment you start up this software it's easy to see why it's called MORE: the initial screen houses more menu items than most people can comfortably cope with. But this is hardly surprising as the manual claims the program is a word processor and a fully fledged outliner as well as a presentation graphics package.

MORE 3.0 is supplied on five 800K

MORE 3.0

Supplier

Symantec (0628) 776343

Price

£99

Good Points Simple structure. Lots of

features. Excellent on-line help.

Bad Points No graphing. Not System 7 savvy (version 3.1 is imminent and will be).

Conclusion Worth considering for frequent presentations.



floppies and will run on any Mac from the Plus upwards, providing it meets certain basic requirements. The system must have at least 1Mb of memory, a hard disk, a double sided floppy drive and System 6.0 or higher. Unfortunately, as with rival products, the program isn't System 7.0 savvy but will run happily under this software without modification.

Getting going

Installing the program is simply a matter of using an auto-install routine on disk one, after which a quick double click on the MORE icon is all that's needed to get things going. The program opens in outline mode and it's from here that most presentations start: they don't always have to, but it does make life easier.

MORE's outline facility works in much the same way as any other, but includes many powerful features normally found only in dedicated outliners. These include both movable and collapsible headlines, full search and spell-check facilities, headers and footers, comment windows and graphic pasting. Quite why you'd want to paste graphics into an outline is a mystery, but the option is there should you ever need to do so.

Outline mode is used to work on the structure of your presentation, with headlines denoting different slides and subheadings representing their contents. With this arrangement you can quickly build up a logical layout or 'slide script', which can then be made into a bullet or an organisational 'tree' chart. Bullet charts are the most complex to make up, but in turn they allow you to be far more creative.

Special libraries

Bullet charts are created using More's special libraries that contain the different elements needed in order to put them together. Possibly the most important element is the chart layout, which controls things such as text size, colour, style and the background pattern. The layout library contains a number of different preset designs and each will give your final slide a completely different appearance.

Another important library is the ClickArt library, which contains 'objects' or images that you can use to spice up your slides. Symantec supplies a large number ranging from flags from around the world to pictures of Beethoven, the Macintosh and the original IBM PC. However, I did notice a lack of cute animal pictures; a shame, as these go down well in presentations.

MORE has a complete set of drawing

tools for creating original artwork and adjusting text and graphics on screen. These include a freehand line drawing facility, geometric shapes, a text tool, and fill tools for controlling the colour of the background and ClickArt objects. Several new menus also appear when you're designing bullet charts, including one that offers an option entitled Chart Tutor.

The Chart Tutor will take you through slide development step by step, giving help with each part in a simple yet comprehensive way. Beginners will find it enormously helpful — I know I did, but experts can also use it to quickly go through the basic steps of chart building. I found it easier to set chart dimensions using the Tutor than go through the normal selecting options from the menu routine.

Tree Chart designer

MORE's Tree Chart designer works in a similar fashion, but unfortunately there isn't a specific Tree Chart tutor. These charts are easily put together, however, as most of the information needed for them will be contained within the presentation outline. There is a set of Tree Chart drawing tools, for repositioning, reshaping and colouring the different nodes on your chart.

Tree charts are best used to show an organisational structure such as the staffing setup inside a large company. They can be effective on their own, but you can also cut and paste them into bullet charts to give your slides an even more professional look.

Graph designer

Other key features in More include excellent on-line help, a speaker's notes facility, a slide show tool and a comprehensive graph designer supplied as a separate program. With this you can add ten different types of graph to your slides, including pie, bar, area and stacked column affairs. These can be created from scratch by entering figures in a worksheet window or by importing data from ASCII files, Lotus 1-2-3 files (WKS and WK1) or BIFF files — whatever they may be.

When it comes to documentation the package is also well endowed — no less than four manuals can be found lurking inside the box. Each is a well written and clearly laid out affair, especially the tutorial which really is easy to follow.

Competent

MORE 3.0 is an incredibly competent presentation package, capable of coping quickly and easily with almost everything you'd want to do. The fact that

it's on the Macintosh gives it an edge in ease of use and its design and simple structure make it easy to understand. If I had to produce slides on a regular basis, I would consider using this software to do the job.

Chris Cain

WordPerfect Corp DrawPerfect 1.1



In what is described as an *interim* version, DrawPerfect 1.1 has appeared 18 months after its original launch. The manuals are rebound, though unfortunately not rewritten. An attempt has been made with a thin *Getting Started* supplement to make everything more user friendly, but there is no change to the *Workbook* which manages to combine turgidity with an irritating tweeness in its choice of Mickey Mouse characters. The main *Reference Manual* is as complex as ever.

Installation is straightforward, taking about 12 minutes, though it is a pity that the manuals say nothing about disk space required (a common software fault). With just 1.8Mb available, the installation itself warned at the start that this would be insufficient but left one guessing as to what was needed. Freeing another 0.5Mb allowed the installation to proceed, only for it to halt again later. Another 0.5Mb was freed, and installation was completed, leaving 0.4 still free.

Nowadays 2.3Mb is small beer for a graphics program, when software like Harvard Graphics weighs in at a recommended 15Mb. In fact, DrawPerfect can be easily trimmed to well below 2Mb with the removal of inessential files, templates and so on, to a floppy.

Spartan

Still more spartan is its need for memory, running for most of this review on a 12MHz 286 with 640K. Most competitors of comparable power

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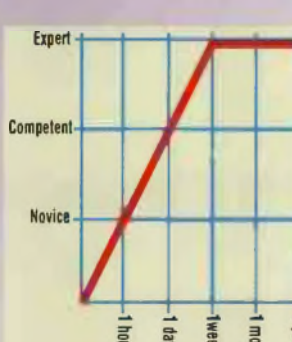
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PC TODAY CHECKLIST

PC TODAY PROFILE



Ease of use	✓✓✓✓✓
Functionality	✓✓✓✓✓
Documentation	✓✓✓✓✓
Value	✓✓✓✓✓
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PRESENTATION GRAPHICS SOFTWARE

	Aldus Persuasion 2.0 (Mac)	Aldus Persuasion 2.0 Windows	Borland Applause II	Borland Quattro Pro	CA Cricket (Mac)	CA Cricket Windows	Claris Mac Draw Pro	DR Present- ation Team	IBM Hollywood	Lotus Freelance DOS	Lotus Freelance Windows	Micrografx Charisma	Microsoft Power- Point (Mac)	Microsoft Power- Point 2.0	SPC Harvard Graphics 3.0	SPC Harvard Graphics Windows	Symantec MORE	Word- Perfect Corp. Draw- Perfect
TEXT																		
Text ruler	Y	Y	N	Y	N	Y	N	Y	Y	N	N	Y	Y	Y	N	N	N	N
Rotate text	N	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	N	N	Y	Y	N	Y
Scalable fonts	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Spell checker	Y	Y	Y	N	N	N	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
Adobe Type Manager	Y	Y	N	N	Y	N	Y	N	Y	N	Y	N	N	Y	N	Y	N	N
DRAWING TOOLS																		
Freehand draw	Y	Y	Y	Y	N	N	Y	Y	Y	Y	N	Y	N	N	Y	Y	N	N
Group/Ungroup	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
Rotate	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y
Flip	Y	Y	Y	Y	N	N	Y	N	N	Y	Y	Y	N	N	Y	Y	Y	Y
Evolve	N	N	Y	N	N	N	N	N	Y	N	N	N	Y	N	Y	N	N	N
Align	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Step and Repeat	N	Y	N	N	N	Y	N	N	Y	Y	Y	N	Y	N	Y	Y	Y	Y
Colour ClipArt	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y
Grid	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Guide Lines	N	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	N	Y	Y
CHARTING																		
Automatic bullet charts	Y	Y	Y	N	Y	Y	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
Organisation charts	Y	Y	Y	N	N	N	N	Y	Y	N	Y	N	N	Y	Y	Y	Y	Y
Dynamic Data Exchange	N	N	N	N	N	N	N	N	Y	Y	Y	Y	N	Y	N	Y	N	Y
Number of graph types	9	9	37	14	12	9	N	14	11	13	36	42	10	10	12	12	4	8
SLIDE SHOW TOOLS																		
Number of transitional effects	8	8	25	24	N	11	N	N	11	14	13	18	N	N	9	8	24	42
Run-time slide shows	N	N	Y	N	N	N	N	N	Y	Y	Y	N	Y	Y	Y	Y	N	Y
WYSIWYG "thumbnail" view of slides	Y	Y	N	N	N	Y	N	N	Y	N	Y	N	Y	N	N	Y	Y	Y
Slide sequencer	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
PRESENTATION TOOLS																		
Master slide	Y	Y	Y	Y	N	N	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	N
Graduated background	Y	Y	Y	N	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Speakers notes	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Audience handouts	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Outliner	Y	Y	N	N	N	Y	N	Y	Y	Y	Y	N	Y	Y	N	Y	Y	N
Automatic colour schemes	Y	Y	Y	N	N	N	N	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Layered slides	Y	Y	Y	Y	N	N	Y	N	Y	N	N	N	Y	N	Y	Y	Y	N
IMPORT FORMATS																		
ASCII	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
PCX	N	Y	Y	N	N	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y
BMP	N	Y	N	N	N	Y	N	N	Y	N	Y	N	Y	Y	N	Y	N	N
TIF	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
GIF	N	N	Y	N	N	N	N	N	Y	N	N	N	Y	N	N	N	N	N
WMF	N	Y	N	N	N	Y	N	Y	Y	N	Y	Y	N	Y	N	Y	N	N
CGM	N	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y
EPS	Y	Y	N	N	Y	Y	Y	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
WK1	Y	Y	Y	Y	N	Y	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	N
IMG	N	N	N	N	N	N	N	Y	Y	N	N	Y	N	N	N	N	N	Y
DETAILS																		
Supplier	ALDUS UK	ALDUS UK	BORLAND INT. (UK)	BORLAND INT. (UK) LTD	COMPUTER ASSOC.	COMPUTER ASSOC.	FRONTIERE DIST.	FRONTIERE DIST.	FRONTIERE DIST.	LOTUS DEVELOP- MENT	LOTUS DEVELOP- MENT	MICROGRAFX	MICROSOFT	MICROSOFT	SPC UK	SPC UK	SYMANTEC UK	WORD- PERFECT UK
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wouldn't even install to these levels, let alone run (though to be fair, a modest increase to 1Mb is necessary to use the Grab file conversion or for file swapping through the Shell Clipboard with other programs). DrawPerfect itself requires 384K.

DrawPerfect is of course from the WordPerfect stable whose other runners include PlanPerfect and DataPerfect, neither of them exactly trailblazers in these days of Windows Wonderland but all competent, fully featured programs.

The pedigree is important because of the huge installed base of WordPerfect users, just as the modest hardware requirements are important for the majority of business users who are content with 286 or lower level 386 machines. Even a 10MHz XT will suffice.

Power at your fingertips

DrawPerfect shares the strengths and complexities of its parent program. It will do a lot, but you will have to work at mastering it. But, once you are even halfway there, using these two programs in harness as they are intended to be used, you will have power at your fingertips which is at the threshold of desktop publishing. The majority of users, producing documents with charts and illustrations, will never exhaust its capabilities, let alone need anything else. Backed by the fully supported scalable fonts of a LaserJet III printer, highly professional brochures can be produced.

A bog-standard 286 with a basic 640K RAM will do all of this, with WordPerfect directly importing graphics which can then be scaled, moved, rotated, positioned and text wrapped,

with the combined layout viewable (though not editable) in a WYSIWYG pre-view screen. Upping the memory one notch to 1Mb brings yet more interplay, allowing you to move to and fro between programs, cutting and pasting text and/or graphics, and using the WordPerfect Shell to link with PlanPerfect and DataPerfect.

Waiting

These are really Windows-like achievements (and even that assumes the DDE links that not all Windows programs offer), but at a speed which has the hardware waiting for you rather than the other way round. This speed advantage remains with higher powered hardware too, only becoming academic at the highest levels.

DrawPerfect has the usual range of drawing tools, together with a library of clip art which can be readily modified: not merely shrunk, rotated, reversed, and so on, but broken down and altered in its smallest components.

There are over 250 art images in the library supplied. DrawPerfect uses its own WPG graphics format but it can also directly retrieve CGM, DHP, EPS, GEM, HPGL, IMG, MSP, PCX, PIC, PNTG, PPIC and TIFF files. For unsupported files, a Screen Capture Program is provided.

DrawPerfect does everything required of a fully featured Business Graphics program, constructing graphs and charts from x and y axes or from spreadsheet data and filling with either colour or etched patterns. As expected from a program with its parentage, there is good text handling, a wide range of fonts and comprehensive printer support. A nice touch is the visible display

of fonts on the font selection screen. For those in a hurry, 24 text and graph chart templates are provided for customisation.

Text around a circle

A new feature is the facility for placing text, in a choice of fonts, styles and colours, around a predefined circle. Typically for WordPerfect programs this is less than intuitive and there is as yet nothing in the manual to help you, though a phone call to WordPerfect technical support quickly produced the answers. The feature, once comprehended, is a nice addition.

Although not tested, there is a comprehensive Slide Show program with which you can create a standalone (runtime) presentation. This can then be copied onto a single floppy and run from other computers without the complete DrawPerfect program.

Business graphics software rarely makes a point of its freehand drawing facilities. DrawPerfect can handle this with considerable aplomb. It can't turn you into an artist, any more than a word processor can make you a writer, but it offers all the tools to turn out drawings a great deal more sophisticated than its (or most) clip art offerings.

Getting fresh

After all, any half decent business graphics package around today will offer you gavels, town-criers, globes, and so on, which rapidly become the graphic equivalent of clichés. DrawPerfect has a huge range of these so you will be a long time exhausting them, but the real freshness — and the real benefit — comes in drawing your own.

Geoff Coggan

DrawPerfect 1.1

Supplier

WordPerfect UK (0932) 850505

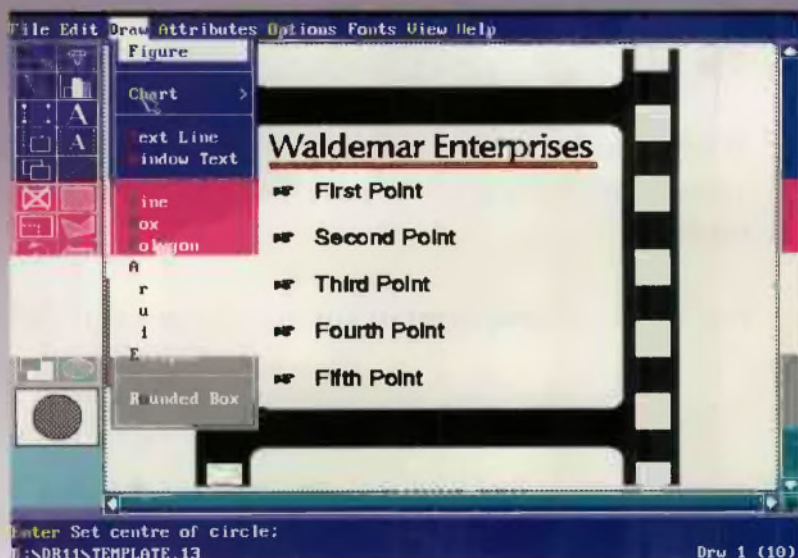
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Good Points Fully featured and nice dovetailing with WordPerfect, with which it shares many keystrokes.

Bad Points Manuals as opaque as ever.

Conclusion The obvious addition for WordPerfect users.



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High flier



Fred Gibbons, president of Harvard Graphics house SPC, does death-defying aerobatics in a private jet to relax. But macho acts don't help in a Darwinian market: you need foresight and good products to survive, and Gibbons claims he has them. Simon Rockman met him.



Breakfast at Claridges sounds glamorous, and it is. The Art Deco hotel is the haunt of rich and powerful Americans visiting London. Fred Gibbons, president of Harvard Graphics corporation SPC, fits this profile. He's on a flying visit to address a conference, and to show off the new multimedia extensions to SPC products, principally HG for Windows. Despite eight hours of jet-lag, he seems better prepared for our early meeting than I am.

My preparation involved looking at the company history and products. His included learning that I fly kites at weekends. Fred Gibbons also flies at weekends, but his kites are a little bigger. 'I've got a Beachcraft Barron with fully pressurised cabin,' he tells me, 'but that's just my stationwagon.' For fun he flies a T37 two-seater jet trainer. Very fast and difficult to fly, but clearly not difficult enough: he and five like-minded friends perform aerobatics

as a team. 'We are bigger than some countries' airforces,' he smiles. The plane lives at a scenic airstrip near Lake Tahoe, and he offers me a ride if I am in the area — the kind of offer you *arrange* to be in the area for.

Gibbons' first military trainer was a T28, the same type 'Wild' Bill Stealey of Microprose owns. This has a reputation for incredible power: the 1400bhp engine will twist the aircraft on full throttle. Gibbons went for something faster after six months. If this is what he does for kicks, you start to wonder what he is like in the boardroom. And how he got there.

Gibbons is originally from Woods Hole, a small fishing town near Boston. He went back recently and saw that a tank in the town which contains seals now has a sign prohibiting the population from swimming with them. Fred likes to think that

PHOTOGRAPHY BY JOHNNY MILLAR

his youthful antics had something to do with the construction of the sign. Perhaps because of this Bohemian nature he became a fine artist, an oil painter, and it was this training which led him to computing. He became interested in computer art long before displays discovered bitmaps or colour. His early work used an IBM 7090 with a punch card reader for input and a Calcomp plotter for output. Starting with a basic shape and then using the computer to calculate transformations, it was a long way from what we would regard as computer art today.

This led to a standard programming course using PDP 11s and PDP 9s with a CRT. This in turn led to a BSc and MSc in computer science. He claims to be a 'programmer at heart' but 'technically obsolete'. He says this technical background gives him a 'real love for products which make things better for users'.

Some of the work he did at university would be considered leading edge even today. It involved handwriting recognition and artificial intelligence. But it was a more mundane project which started his career path. He founded a company producing a job-costing program for printers (who have to balance the cost of setting up a press against the capital cost of the loan on the equipment and the cost of running the job). The software ran on a Data General Nova, a substantial mini-computer; today it wouldn't tax a Gameboy.

Wealth of experience

After selling the software company Gibbons continued his education at two of the most high-powered organisations in America — Harvard and Hewlett-Packard. He emerged from Harvard with a post-doctorate in business and from HP with a wealth of experience gleaned between 1975 and 1981. Even today he is still in touch with founders Bill Hewlett and Dave Packard who, although officially retired, are still very much involved with the company.

The pace of change has accelerated since then. 'It took HP 30 years to become a \$100 million company. SPC had to do it in eight years,' Gibbons says. Things are tougher, too. You have to fight harder to survive now that growth in the computer industry has slowed, and you cannot judge the future by the past. 'When the tide is coming in even the dead fish rise,' Gibbons quotes.

The name of his company comes from an idea he expounded to Steve Jobs in 1977: that 'software is going to be like sheet music'. Hence the name Software Publishing Corporation, and the original intention of buying in and 'publishing' software. This is what he did with PFS for the Apple II, launched in September 1980.

A constant theme in Gibbons' plan is the need to restructure, 'renewal' in his parlance. While the composer/publisher set-up works for music and games programs, a need to develop in-house soon became apparent. This was SPC's first 'renewal', in 1982. The second came in 1983 when SPC moved to support the fledgling IBM PC. The third came with the move up-market — PFS was a cheap package. Harvard Graphics, developed in-house, was launched in 1986.

Fred Gibbons doesn't let the grass grow under

his feet and the philosophy behind Harvard Graphics was set from the start. 'We used a marketing model — 'The brand is more important than the company'. That Harvard Graphics is almost certainly a better-known name than SPC shows this approach had its effect. The overall strategy was to 'become a multi-brand, multi-niche company'.

Now it is time for another renewal, Gibbons says. I ask how he knows. The flip answer, identified as such, comes back like a bullet: 'When sales go down it, is time to change.' This honesty (SPC made a loss of \$18m in 1991 — albeit after paying over \$25m for SuperBase 4 house Precision Software) is balanced by a wider view which shows SPC in a better light. 'A good company survives change, a great company anticipates the change.'

Gibbons identifies the major factors for change as being Windows, which says 'had the impact on the industry that the airplane had on the train'. Still more important is the slow awareness of a move from mainframes to networked micros. (He calls that trend 'upsizing', seeing it in terms of more power to the desktop; most of the industry, seeing it from a mainframe perspective, calls it downsizing.)

Denial

He denied that SPC was slow to react to the advent of Windows, claiming that users with an installed base of old machines are looking to move rather than moving. DOS is far from dead, if only because of the investment in existing software — particularly in terms of how long it takes to write. 'Harvard Graphics 3.0 is 200 person-years work,' cites Gibbons. He believes it will take up to three years for Windows applications to start outselling DOS ones. To this end, he expects that SPC will produce DOS applications for the next two years.

When the mass of users does move, SPC will be ready. Windows will be just 'the enabling glue' and the target machine will neither a PC nor a SparcStation: it will be the Network. Connectivity





is the ultimate goal. Email and fax (the kind of thing SPC's InfoAlliance is good at) will become more important. Gibbons claims that InfoAlliance was an 'information at your fingertips' product long before Microsoft started bandying the phrase.

A network has to be simple to use. 'When the telephone was first introduced, it was conceived as impossible that there could be a telephone in every home. There could not be enough switchboard staff to operate the system, and the boards that wires had

to be plugged into would need to be too big. A modern network has to be as 'self-dial' as a telephone. It needs to be as easy to use as a single machine.' Gibbons sees InfoAlliance as a key to this: SuperBase sells to programmers; InfoAlliance is aimed at users.

SuperBase development will continue on both sides of the Atlantic. UK research and development has doubled, with the original authors retained. There has been some rationalisation. The Atari ST version has been killed and the Amiga version disposed of to Amiga specialist Oxxi. But the main thrust will be to take on the increased competition in the Windows database market — possibly the hottest growth area for 1992.

The salesman shines out from beneath the jet-lag. 'We will produce the best programmers' database on the planet,' smiles Gibbons. Our photographer is between rolls and misses the smile. Gibbons

doesn't smile again as he starts to talk about the rivals to SuperBase.

Paradox for Windows is a bigger worry than Borland's other forthcoming release, dBase for Windows. 'When you go to a GUI, the change is as different as moving from an Apple II to a Mac. An application which has its whole history on the Apple II has to make its own way under a GUI.'

The new strategy, clearly, is to take InfoAlliance and SuperBase side by side onto networked ma-

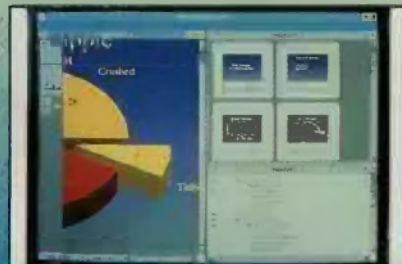
Harvard Graphics goes multimedia

The multimedia facilities within Harvard Graphics for Windows first became apparent at Intel's demonstration of the DVI technology used in Intel's Actionmedia 2 board late last year, when the microchip giant handed round declarations of support from SPC among others. Harvard Graphics for Windows has been enhanced to take advantage not only of the usual Windows goodies, but also of the sound and vision element which is ideal for presentation applications.

The question is, has it succeeded? The software offers not only a facility for straight video sequences within its presentations, but also for stills, animation, waveform audio functions, and MIDI linkups. Users can access data from both CD and the hard disk. However, the animation sequence that SPC used was hardly more than a joke, simply showing an image of a road that jerked up and down as the viewer rode over it.

The limitations of the video

facilities of Harvard Graphics lie not with the software, but with the hardware and the standards imposed by Intel, which developed the Actionmedia 2 boards in conjunction with IBM. The full-motion video within DVI is reasonable, reaching VCR quality at a push. However, the sound on the Harvard Graphics



demonstration was abysmal, to the extent that it was difficult to understand what people in the video sequences were saying.

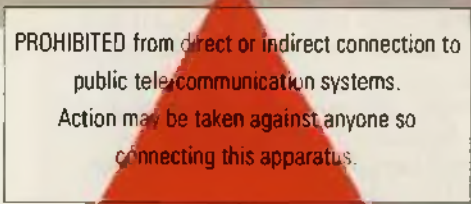
Interestingly, SPC's demo was significantly worse than some of Intel's, because the Harvard presentation used images of people talking at a desk. Intel's best demonstration was of a skiing sequence — much

easier to compress and decompress quickly because there are large areas of the same colour. The compression algorithm enables one minute of video to be stored on 8-10Mb of hard drive, or a Camcorder or VCR can be linked directly into the hardware.


The only problem with the latter solution is that users would have to organise their sequences sequentially to avoid embarrassing waits while they wind on their video recorders. An SPC representative said he had a hard drive with more than 100Mb, which he considered to be the current norm, so hard-disk storage shouldn't be a problem.

Perhaps the most interesting Harvard Graphics for Windows feature is its ability to launch another application from within a presentation using the Hypershow button. This enables the user to perform detailed analyses of sales figures, statistical distributions and the like, or to access a database. From a presentation point of view, it facilitates the answering of awkward questions, by having the facts where you want them.

Danny Bradbury



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chines. In a few years all SPC products will have to be available in versions which run on a server. The Windows-based word processor, ProWrite, is not a primary part of the strategy but is useful for providing some SPC glue between products. Gibbons cites the move upmarket as being behind the disposal of the PFS range to Spinnaker Software. The latest renewal will see the SPC name coming to the fore, a contradiction of the previous (successful) low-profile policy.

The strongest name is that of Harvard Graphics and so that has been used for the new product in the SPC range, Harvard Draw for Windows. Code-named Gunslinger, because it was supposed to be 'quick on the draw', it is gunning for Corel and a big play was made of this at the launch. Corel currently has 77% of the market and that is the slice Fred Gibbons wants for Harvard Draw.

Market spite

He cites the way Quattro Pro took over from Lotus 1-2-3 as proof that this scale of market-switch can be achieved. But he acknowledges that there is increasing competition, and that Harvard Draw will need some updating. To achieve the increased share he wants short cycle times with new features fast to market. The new Aldus package is less of a worry; SPC's bias is towards the business professional, while Aldus has traditionally dealt with the graphics professional. This 'second order differentiation' has led to different feels to the programs, with the result (he claims) that Harvard Draw for Windows is a more rounded product.

While Fred Gibbons is clear about where he sees his company going, he is not so sure about the industry as a whole. He feels that the IBM/Apple deal was born out of spite for Microsoft, along the lines of my enemy's enemy is my friend, with Microsoft being the common enemy. The new alliance is strange and Gibbons does not believe it will work. 'Competitors eat each other,' he says. He is concerned about the change to the RS/6000 chipset. 'For a company to change CPU is pretty radical. This is high risk.'

The alternative is Windows NT. SPC applications will run by default, but this does not indicate that SPC has made any choice between NT and OS/2 2.0. 'We the application writers are not warriors. We are camp followers,' he says. The skill, of course, is in having the right product for the right platform. But with a move to high-level programming this matters less. 'We are tired of platform wars — we are not going to pick the winners.'

Gibbons, even when even pressed, won't give a personal (as opposed to policy) preference between NT and OS/2. He sits on the fence. 'Windows was a service to end users. Bill

[Gates] is the smartest guy in the business. But OS/2 has what we need — that's good news.'

Gibbons doesn't want an operating system. He wants a choice. 'Ideally you will have software on the server, and the client can be platform independent.' This is clearly a long-term view. In the short term, Harvard Graphics for Windows is the SPC flagship. Harvard Graphics, the backbone of the company, has been around since before presentation graphics were widely known leave alone fashionable. Now they are the fastest growing PC software market.

Harvard Graphics is ideally placed with a 52% share of the market. To ensure that it remains at the top, new features have been incorporated in the Windows version including DVI support for multimedia. This will be supported through the recently announced Harvard Graphics Centre Programme, which offers consultancy services as well as the creation of slides and company logos.

Stepping stone

Still, Harvard Graphics for Windows is just a stepping stone. I left Gibbons clear in my mind that if the next renewal meant SPC wanted to do something other than presentation graphics, he would ignore those 200 person-years of work in favour of a new strategy. In company terms Gibbons is an Darwinist, and will happily re-evolve his company to keep ahead of the competition. Far from having his head in the clouds, Fred Gibbons will pilot SPC through more loops and turns than the Red Arrows — and then take to the skies in his time off.

After taking the last of the photographs, John Millar made a few disparaging comments about British Art Deco not being as good as the 'American stuff' and we left the hotel's splendour for the grey London streets.



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Dolch Color Portable Multimedia Kit

It's a wonderful spec: a 33MHz 386 with one of Sharp's excellent TFT screens, plus CD-ROM, a sound board, a video board and Windows MM extensions. But it's too big for comfort, far too greedy for disk space... and there's a small matter of £8500. Danny Bradbury reports.

The multimedia focus seems to be largely on hardware at the moment, with custom PCs finally beginning to filter through to dealers. There are few actual applications, apart from Harvard Graphics for Windows and some authoring packages, and the industry seems most concerned with which standard to follow.

Most of the hardware announced so far has been desktop based. Few portables as yet are capable of handling multimedia (in the sense of handling software which encompasses high-quality video, animation, and sound sequences).

Enter Dolch. It's a US-based outfit specialising in colour portable PCs, using TFT flat-screen technology for high-quality displays. Dolch is run in this country by John Patterson, who also holds the title of founder of Epson UK. He set up Dolch's UK branch about a year ago, and has been churning out colour portables ranging from a 386SX up to a 486/50 ever since. He recently followed the parent company's lead, jumping on the multimedia bandwagon with an add-on product which is designed (so the company claims) to fit onto any Dolch PC.

Strategy

It consists of a sound board, a video card, a CD-ROM, a pair of external speakers, and Microsoft's Multimedia Extensions for Windows. Dolch's strategy has always angled towards the high-end, high-cost sector, and pricing for the add-on kit followed this tradition. Until recently, it was priced at £3800. Add the cost of a Dolch machine to run it on and you were talking roughly £12,000, just for the privilege of making a few pretty talking pictures. But on 1 February, Dolch cut the price of the add-on to £2500, and you can now pick up the 386/33 colour machine, with all the multimedia goodies built in, for around £8500. Perhaps the company has finally realised we are in the depths of a recession.

Dolch claims the machine is attracting interest

from several quarters and at the time of going to press had actually sold the first unit. The product is aimed mostly at the presentation market, the idea being that clued-up (and extremely rich) corporates will use it both for in-house training and to impress potential customers.

The Dolch supplied for review with the multimedia kit was an ISA-based 386/33C (the C stands for colour) offering no great breakthroughs in terms of design, although the dark-grey case (tastefully ridged along the sides, top and back) gave it a corporate look. It's of the old luggable form, with the screen and logic in the main case, which stands on edge. The detachable keyboard doubles as a lid, displaying the white Dolch logo. Two clips fold out to act as keyboard tilts. You can remove and replace the keyboard quite easily by pressing two buttons above the screen. While this is convenient, I would have preferred a little more give — the clips look as though they could break if used too hard, too often.

The screen takes up most of the front area and is surrounded by some decorative white lines. The rest of the front is occupied by a logo and the turbo, hard drive and power lights. The turbo feature can be toggled using CTRL-ALT - or +. Interestingly, this feature works by enabling and disabling the cache rather than by changing the clock speed. A large silver reset switch is set sensibly well away from any other buttons.

On the right-hand side are the CD-ROM and 3.5in floppy drives, the former containing a headphone socket and a dial for the volume. You can play audio CDs using the jukebox facility from the Windows Multimedia Extensions, which are supplied on CD-ROM. The left of the machine houses the keyboard socket and six expansion slots, four of which are taken up with the video, sound, screen control and serial cards.

The power socket and switch (all too easy to knock accidentally) are at the lower rear of the



PHOTOGRAPHY BY CHRIS BELL

machine. The case itself is made out of plastic which seems fairly hard and brittle. Considering the 'ruggedised' quality Dolch likes to attribute to its machines, I was surprised there were no rubber corners or matt-black rubber-like surfaces.

The keyboard, which connects to the left side via a coiled cable, has 86 full-travel keys, which are adequate but not wonderful to type on. There are 12 function keys spread across the top of the machine and a separate numeric keypad. A long recess at the top of the keyboard houses the coiled cable in transit.

The machine is not in itself something that you'd want to lug onto a train or carry any great distance — it weighs 18lbs and measures 405x240x200mm, and the handle is rather hard. It is portable only by virtue of its impressive carry-case, which has a comfortable shoulder strap and compartments for cables and other peripherals.

Setting up

Setting up the kit required little effort. The speakers were small enough to be set on top of the computer. The speaker port was clearly labelled, as was a video port for plugging in a camcorder if required. There's no monitor to be plugged in so the only other connection to be made was the power cable — the one supplied was reasonably lengthy.

Booting up showed the fans to be the most noisy component. The hard drive is virtually silent, save for a few clicks when it is accessed, and the CD-ROM drive is smooth and emits hardly any sound. All in all, when no discs are being accessed, the computer makes about two thirds as much noise as my clunky old 286 home machine.

The other common irritant in computers is electrical noise. The machine bears a disclaimer that some radio interference may be experienced, but I



△ Dolch's detachable keyboard doubles as a screen cover

found the problem to be more serious. The sound card in the review kit was an unshielded Soundblaster Pro from Creative Technologies. Listening closely to the speakers, background noise is particularly notable during disk access. The computer innards are surrounded by a metal casing which hopefully screens a lot of other interference.

Opening up the unit proved to be fairly easy, with just three screws securing the back casing. This slides off easily, to reveal an interior with little airspace. Tucked away in the bottom-right corner is the power pack, taking up about 25% of the back surface area; it's autosensing, able to take anything from 90-250 volts at 50-60Hz. Within this unit is the largest fan, which faces out of the side of the computer.

On the left side of the unit is a separate case harbouring the Sony CD-ROM and a 3.5in Teac floppy (5.25in can be supplied). The most interesting storage is the hard drive, which sits atop the other two drives, bolted on by a small metal strip and carrying a sticker voiding the warranty if removed. Unlike most other drives, easily identifiable by their square casing, this one is only semi-covered by the metal strip attaching it to the main drive housing. The rest is covered by a sleek, streamlined black plastic cover. It's a 120Mb Conner, and a 200Mb version is promised soon which will be dinky enough to mount on top of the floppy and CD-ROM units. The current drive has a sub-19ms access time and can withstand 3G's worth of shock.

Multimedia cards

The machine uses three cards directly for multimedia. One Dolch-made half-length unit controls the Sharp flat-screen TFT display. Dolch specially designed it to give an edge in terms of colour and resolution. The company has allied a Chips & Technologies 457 VGA BIOS chip on the board to a Chips & Technologies 9001 on the video control-

ler card, expanding the range of colours available by using pulse width modulation and dithering techniques. A 'feature port' allows you to connect the TFT screen directly to an overhead projection unit. A connection to the video board handles the multimedia video input.

The 9001 C&T-made video controller card also handles the video input and output, using its own dedicated memory and frame-grabber algorithm. The video input jack on the board can handle PAL or NTSC. (Apparently, the main reason that the UK operation took a little longer to ship the multimedia pack than the US is because it had to restructure the registers in the video card to accept PAL properly.) A mini DIN plug acts as a super-VHS input jack.

Unfortunately, the board is lacking in features. Running an animated presentation from the hard disk, I thought it amazing that the decompression algorithms worked so fast and so well — until I discovered that the system performed no compression or decompression of images to save hard-disk space. At review time, at least, Dolch US seemed to think the hard disk had ample space for the video images needed in a high-quality presentation. Some hope, given that you need 700K to store each uncompressed video frame, not counting sound, and that PAL uses 25 frames per second for full motion video and that NTSC uses 30.

Dolch also claims, however, that it is working with Jpeg and DVI compression technology to rectify this situation. The UK company, which admits the limitations of the hard-disk storage, promises an add-in DVI board by the time this goes to print. It also promises a C-Cube chip on the video board later in the year, which would implement the recently ratified Jpeg standard. Intel's DVI may be a little patchy and expensive, but it can fit more than five seconds of video onto your hard disk.

Video recorder

The only other option at the time of writing is to run your video recorder or a camcorder through the video input jack on the C&T board. This will give a fast, colourful image, because it is little more than straightforward throughput to the screen. The downside is that presentations would involve lots of manual stopping and starting. 'Better than lugging a massive CRT around,' said the enthusiastic technical expert at Dolch. Maybe, but for £8500, customers have a right to better. Hopefully by the time you read this, Dolch will have solved the problem.

As I have stated, the review unit came with a Creative Technologies Soundblaster Pro sound card. But by press time, Dolch had decided to switch to the Mediavision Pro AudioSpectrum board (see page 231, *PCW* February 1992), which can sample at twice the rate of the Soundblaster (44kHz in stereo or 88kHz in mono). It is also shielded, so that there will be no interference from the processors and drives, so that you won't have to listen to the computer thinking. Moreover, the MediaVision volume control has many more steps.

The new card also has a standard SCSI CD-ROM interface rather than the SoundBlaster's proprietary one. This makes it much less messy from a development point of view. It also means the multimedia units will be shipped with a different CD-ROM drive, from Matsushita, so you lose the

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△ The lunchbox design houses a lot of electrics

phones-socket and volume control on the CD-ROM, but Dolch doesn't see these as particularly valuable. Hopefully, when the Pro AudioSpectrum Plus board makes an appearance, Dolch will start using this, giving access to industry MIDI standards and all sorts of other goodies.

Removing the cards requires care, because the Dolch board and the Chips & Technologies video card are connected by a short and rather stiff ribbon cable. If one card is dislodged too sharply, you might sever one of the connectors. If you also take out the power pack and the main drive unit, the motherboard presents itself open for closer inspection. The six full-length slots are at the top right, with the AMI keyboard controller chip directly underneath, near the keyboard socket connections. At the bottom rear are the eight SIMM slots for up to 32Mb RAM — 4Mb OKI 80ns RAM is supplied as standard. Thankfully, for such an expensive machine, the release mechanisms on the slots are metal, presenting little problem in removing and replacing.

Sharp screen

The screen, fresh from Sharp's Japanese factory, has fallen foul of the US's anti-Japanese stance in the trade wars. Therefore, it has to be shipped into Germany for assembly to avoid the 62.5% levy imposed on the other side of the pond. The Dolch machine, thanks to its aforementioned linking of the C&T 9001 chip, is supposedly the only one on the market to display 256 colours from a palette of 24,000 at 640 x 480 resolution. Compaq's unit manages only a palette of 4096.

Contrast, brightness and colour are all set at the factory, because Dolch believes it can attain better results there than you can. This is a little arrogant, and it would have been nice to have a choice. The TFT screen has three transistors sitting behind each pixel, giving about a million transistors all in all.

The refresh rate is approximately 40ms, roughly half that of a bog-standard CRT. Nevertheless, it is fairly easy on the eyes.

The external speakers, black and quite stylish, plug into their own socket on the soundboard. Unfortunately they are less than adequate. Being small they are quite tinny, producing a sound more appropriate for a transistor radio than an £8500 presentation system. Heavy guitar solos, played from the CD-ROM drive using the Windows jukebox system, sound like George Formby's ukelele. However, you can use a standard jack socket to connect to a better speaker system.

Dolch has changed its marketing as well as its pricing strategy since PCW first mentioned this system. You can now buy just the sound card, CD-ROM drive, MIDI interface and Windows Multimedia Extensions for £1100, if you just want to concentrate on the sound aspects. And consider that to make video really usable you'll need a compression facility. The C-Cube will be put onto the motherboard, but if you want compression now you'll want the DVI option, for which pricing has yet to be set.

The only real competition for Dolch in this market comes from the Compaq 486C, which is merely a *potential* multimedia unit — the slots are ready and waiting to be used. There are some obvious differences: the Compaq can get the same number of colours on screen but gives you fewer to choose from; but it does include a strong security system — all the Dolch came up with was a password in the BIOS. But with all the additional multimedia bits, the Compaq would cost more or less the same as the Dolch.

Conclusion

This machine, like the company, is innovative. But, also like the company, it has made a few compromises — last minute change-arounds which should have been fixed well before this kit hit the streets, with important elements promised as 'options' at a later date. The only defence for these gaffes is that Dolch has had to work hard to ship a machine which, if all goes well, will be ahead of many of its competitors — even a giant such as Compaq.

As with the Compaq, too, price is a big consideration. The multimedia add-ons are not available as a kit, so you must buy the computer with the technology installed. This prices the machine beyond the reach of most people, leaving them waiting for the prices to drop.

Specifications

Dolch Color Portable Multimedia Kit Supplier

Dolch UK (0908) 690880

Main processor

386/33

Monitor

Sharp TFT colour

Prices

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Serial killers have certain noteworthy characteristics: firstly, they've often had an unsettled upbringing which makes them sensitive. Secondly, when given an opportunity to communicate, they'll either clam up entirely or happily spill the beans for hours.

And so it is with PC serial ports. Apparently quite stable for the past ten years (compare what's happened to video adapters in that period), the serial adaptor has quietly suffered all manner of secret humiliations. Until now, it has borne up remarkably gracefully. But the scars are beginning to show — as anyone who has tried to use more than two

a single chip, the Universal Asynchronous Receiver/Transmitter. In those early machines (but not, as we'll see, for long) this was a National Semiconductor INS8250.

UARTs do almost all the caretaking of an RS232 link. Indeed, their somewhat monolithic appearance is one reason programmers tread so carefully around comms coding. The table in Fig 1 should give you an inkling why. This is the list of the eight byte-sized registers via which all serial port data, initialisation, and control information is passed between the UART and the PC.

Referring to registers

It is to these eight registers, incidentally, that a BIOS or diagnostics program refers when it reports a serial port at, say, 02F8h. Register 0 of a serial port at 02F8h can be accessed by using the 80x86 IN 02F8h,XX or OUT 02F8h,XX opcode, or their high-level equivalent. Register 1 can be found on port number 02F9h, and so on.

If you have two or more comms ports on your machine, they will all possess these same registers (if they are based on the standard UART) but they will be placed at different positions in the PC's I/O port map. Or they should be, if you've set the serial-board DIP switches correctly.

It's one thing to list what each bit in each register signifies; understanding how it will behave in a given situation is another. Fortunately, with computers you can play around. For the mildly intimidated, the program listed on pages 320/322 should help. It's in viciously unstructured GW-BASIC (to allow any PC user to run it) and is heavily com-

packed (to save space). However, it will allow you to mess around with register settings on your own UARTs and observe the results.

The program's screen mirrors the table in Fig 1. The interface is fairly intuitive:

- ? pulls a value from the registers.
- Data can be entered in both binary and hex.
- ENTER stores the new value on the screen.
- + sends the new value back to the UART.

Serial killer

The RS232 port is enough to drive anyone to terminal despair. Why all those pins, bearing obscure acronyms hinting at unfathomable snags, when 'serial' surely means 'single wire'? Dan O'Brien steps bauldly into the chip behind it all, and presents a utility that will reveal all.

comms ports, or tried to attach a high-speed modem to an AT, will morosely inform you.

Sorting it all out means, as is common with the PC, probing deeper into the sick minds of hardware designers and systems programmers than anyone would rightly wish — but that's what ten years of byzantine developments does to a system design. What follows is not pretty, but may be of use.

The original IBM PC serial port was handled by



You have to recall and send data yourself — the values on screen may not represent what's going on until you force an update.

Register 0, Receive/Transmit, is easily understood; sending a byte OUT to it results in that byte being sent down the serial port. Similarly, performing an IN on this register returns the last byte received by the UART from the serial connector.

The last register, the scratch register, is a cinch too. Write a value to that port (in our example 02F8h+7,02FFh) and it will simply be stored by the UART so that you can recall it with an IN 02FFh later. Not very useful, given a million or so memory locations in RAM, but handy to test our UART monitor program: try loading register 7 with different values.

Sending and receiving bytes seems suspiciously easy. Surely we need to specify baud rates and stop bits, parity and word lengths before we can send data? Certainly — this sort of information is overseen by the Line Control register (3). On this:

Bits 0 and 1 control the number of bits in each transmitted or received character. The 8250 can work with lengths from five bits to eight. Store 00 in these bits for five, 01 for six, 10 for seven, 11 for eight.

Bit 2 sets the number of stop bits: 0 puts out one stop bit per character; a 1 sends two stop bits, except on a 5-bit character length, when one-and-a-half stop bits are generated (half a bit makes sense on a serial port because a stop bit involves only pulling the transmission line low for a certain period).

Bit 3 switches on parity checking, which sends an extra bit between the stop bits and the real byte.

Bits 4 and 5 determine exactly what parity you'll get: 00 gives you odd parity (that is, the total number of ones in the whole character transmission, excluding stop bits, will be odd); 01 gives even parity; 10 means the parity bit will always

be zero, and 11 will make it always one.

Baud rates use registers 0 and 1 which, when bit 7 of register 3 is set, turn into a two-byte store for a port speed rate. This can be read or changed at will. Reset bit 7 of register 3, and the registers return to their previous function. To work out what value to set for what baud rate, divide the baud into 115,200; thus 9600 baud will require a value of 12 to be stored in registers 0 and 1. The lower eight bits (in this case, 12) should be stored in register 0, then the upper eight (just 0 here) in register 1. All this implies that the maximum baud rate of the 8250 is 115,200; as we'll see, it's a little more complex than that. And putting zero into the register does *not* give you an infinite baud rate; that's cheating.

Fun with LOOP

Register 4, Modem Control, caters for the output pins. DSR (Data Set Ready) and CTS (Clear to Send) are RS232 regulars. OUT1 is connected to nothing on the PC. OUT2 will be explained, if you are patient. LOOP is a factory testing bit (and is great fun if you're using the BASIC UART monitor. When on, it connects internally the serial input to the serial output, and DTR, CTS and the OUT lines are connected to the four Modem Control inputs, so you can send and receive data without bothering to connect a cable).

Registers 5 and 6, the Line and Modem Status registers, provide an inside look at what's going on within the UART. Again, the abbreviations in the Modem Status register entry should ring a bell for anyone who knows a little about RS232 connections, or has stared disinterestedly at those flashing lights on a modem. They are the input lines into the PC, so you can monitor, say, the telephone ringing by keeping an eye on bit six.

Note, though, that some are marked as not indicating the *actual* state of a pin, only that the pin signal has changed since you last read the register. TRING tells you that a ring has just finished. Useful.

REGISTER	BITS	7	6	5	4	3	2	1	0
0 Receive/Transmit	R/W	DATA							
1 Interrupt Enable	R/W	0	0	0	0	MODEM	LINE	TX	RX
2 Interrupt ID	R	FIFO Chip #		0	0	ID	ID	ID	INT?
2 FIFO Reg (16550)	W	RX Trigger		—	—	DMA	RSTTX	RSTRX	ON
3 Line Control	R/W	BAUD	BREAK	PARITY TYPE		PARITY	STOPS	WORD	LENGTH
4 Modem Control	R/W	0	0	0	LOOP	OUT-2	OUT-1	RTS	DTR
5 Line Status	R	FIFO	TXEMP	TXFUL	BREAK	FRAME	PARITY	OVER	DATA
6 Modem Status	R	DCD	RI	DSR	CTS	DCD	TRING	DSR	CTS
7 Scratchpad	R/W	DATA							

Fig 1 Registers of the 8250 UART, first-generation chip behind the RS232

Line Status is the register to consult just before picking up a character from the Receive register. Bit 0 is set whenever a new byte has arrived. PARIT is a parity error, FRAME means that the incoming character was misshaped in some way, BREAK means your communicant has sent a BREAK signal to you, TXFUL means 'don't try and send any more characters, I'm busy', and TXEMP means 'fire away; I'm free'. Finally, OVER, bit 1, informs you that a new character did arrive, but you left it too long before you looked in and its value has now been overwritten in register 0 by another, newer, character. It's at this point that the whole system goes, sadly, a bit psycho.

Interrupts

The 8250 can store only one received character at a time. If another arrives before you've looked at the current one, it overwrites the old one which disappears forever. On a 9600-baud link going at full whack, a PC comms program has approximately 1ms to pick up the character before it (the character, that is) dies. Now, 1ms is a long time in processor terms, but not if you're trying to do windowing and mouse actions, and writing to the hard disk simultaneously. What does a poor programmer do?

The one thing he or she *never* does is use MS-DOS support for the serial ports. That's because MSDOS reads the serial port by *polling* it: it looks at the UART only when specifically asked — that is, when you make a 'Get Character from Serial Port'

call. To preserve a 9600-baud link using polling, the program would have to call this function at least once every 1ms, probably more. It's very rare for polling programs to reach this baud rate unassisted.

A better solution is to use an interrupt-driven routine. This takes advantage of the UART's ability to cause an IRQ — an interrupt request to the processor — when certain definable conditions arise. Once interrupts have been enabled, an IRQ from the UART can cause a selected user routine to respond to those conditions.

Different bits in register 1 (with the baud bit set to 0) can be set by the programmer to specify which conditions should trigger interrupts:

Bit 3: allows interrupts whenever the bottom four bits of the Modem Status register change.

Bit 2: when the Line Status bits change.

Bit 1: whenever the UART is ready to transmit another character.

Bit 0: whenever a character is ready.

The processor can be interrupted by one or more of the conditions, and they are queued in order of importance. To discover what caused the interrupt, you read register 2. This has bit 0 set if no interrupt occurred, and three bits (listed in our table as ID) to tell you what caused what: 000 for a Modem change, 001 for a Free to Transmit IRQ, 010 for Character Received and 011 for a Line Status change.

Then you cater to the interrupt's demands (read Modem Status register, send a byte, read a character, or read the Line Status register), and re-read

register 2 to see if anything else has cropped up, until nothing does. Simple. Pop any characters into a buffer, and there you have it — characters saved from death the moment they arrive.

The speed advantage of using interrupts is so enormous that it's not entirely clear why everybody doesn't use them. Indeed, why doesn't DOS?

Backwards-compatibility is one reason, but principally it's down to what is charitably known as IBM's bad luck. Remember how the first PCs used the 8250, with buggy interrupt handling that early drivers had to get round? NS released the 8250-A, debugged so well that all those early interrupt drivers promptly fell over.

The 8250-B put all the old bugs carefully back in. But by then, IBM had introduced the AT, using NS's new high-speed 16450 UART. This, unlike the 8250B, could in theory cope with 115,200 baud. It couldn't: ATs were too slow to catch the characters even when interrupt-driven. The new UART followed the 8250-A inter-

```
1 REM UART MONITOR for ALL MACHINES. From PCW, MARCH 1992
90 CNUM%=1: REM Change for other COM ports
100 DATA "Receiver Buffer", "Transmitter Buffer", "Int. Enable Reg", "=", "Int. Ide
    nt. Reg", "FIFO Control Reg", "Line Control", "=", "MODEM Control", "=", "Line
    Status", "=", "MODEM Status", "=", "Scratch", "="
199 REM Initialise
200 DIM PIN$(7), POUT$(7)
210 FOR I%=0 TO 7: READ PIN$(I%), POUT$(I%)
220 IF POUT$(I%)="" THEN POUT$(I%)=PIN$(I%)
225 NEXT
226 DEF SEG=&H40
230 PSTART%=(PEEK(CNUM%*2-2))+ (PEEK(CNUM%*2-1)*256)
240 FOR I%=0 TO 7: VIN$(I%)=INP(I%+PSTART%): NEXT
500 X%=0: Y%=0: GOSUB 1000
520 A$=INKEY$
530 IF LEN(A$)=2 THEN GOSUB 900
540 IF LEN(A$)=1 THEN GOSUB 800
550 IF A$<>"X" THEN GOTO 520
560 CLS: END
799 REM Keypress handling
800 IF A$="X" OR A$="x" THEN A$="X": RETURN
805 IF (A$="0" OR A$="1") AND (X%>=0) THEN V%=VAL(A$): GOSUB 1500
810 IF (A$="/" OR A$="?") THEN GOSUB 4000: GOSUB 1500
820 IF (A$=CHR$(13)) THEN GOSUB 4500: GOSUB 1500
830 IF (A$="+" OR A$="-") THEN GOSUB 9000: GOSUB 1500
840 IF (X%=-1) THEN GOSUB 860: GOSUB 1500
850 RETURN
860 N%=INSTR("0123456789ABCDEFabcdef", A$): IF N%=0 THEN RETURN
870 IF N%>15 THEN N%=N%-6
880 V%=(V%*16+N%-1) AND 255
890 RETURN
899 REM Cursor keys
900 C%=ASC(MID$(A$, 2))
910 IF C%=45 THEN A$="X": RETURN
915 GOSUB 3000
916 IF C%=72 AND (Y%>0) THEN Y%=Y%-1
917 IF C%=80 AND (Y%<7) THEN Y%=Y%+1
918 IF C%=75 AND (X%<7) THEN X%=X%+1: IF X%=0 THEN V%=SGN(V%)
919 IF C%=77 AND (X%>-1) THEN X%=X%-1: IF X%=-1 THEN V%=VIN$(Y%)
920 GOSUB 1500: RETURN
999 REM Screen Initialisation
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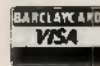
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```

1000 COLOR 3,1:CLS
1020 PRINT "Communication Port #";CNUM%,"I/O Port $";HEX$(PSTART%)
1040 COLOR 1,3:PRINT:PRINT " # Register Read      7 6 5 4 3 2 1 0
      Register Write
1060 OY%=Y%:FOR Y%=0 TO 7:GOSUB 3000:NEXT
1090 COLOR 1,3:PRINT"Use cursor keys, <?> to read new val, <ENTER> stores value
      ,<+> writes to UART."
1100 Y%=OY%:GOSUB 1500:COLOR 7,0:RETURN
1499 REM Write cursor
1500 IF X%=-1 THEN GOSUB 1600:RETURN
1510 LOCATE Y%+4,21+(7-X%)*3
1520 COLOR 0,7:PRINT V%:COLOR 7,0:RETURN
1600 LOCATE Y%+4,45:COLOR 0,7
1610 IF (V%<16) THEN PRINT"[0";HEX$(V%);"]" ELSE PRINT "[\"HEX$(V%)\""]"
1620 COLOR 7,0:RETURN
2999 REM Write register to screen
3000 COLOR 7,1
3010 LOCATE Y%+4,1:PRINT Y%;PIN$(Y%);:LOCATE Y%+4,50:PRINT POUT$(Y%)
3020 LOCATE Y%+4,21
3030 K%=VIN$(Y%)
3040 IB%=128:WHILE (IB%>=1):PRINT SGN(K% AND IB%);:IB%=IB%\2:WEND
3050 IF (K%<16) THEN PRINT"[0";HEX$(K%);"]" ELSE PRINT "[\"HEX$(K%)\""]"
3060 IF Y%<=1 THEN GOSUB 3100
3070 RETURN
3099 REM Special cases for receive char/baudrate divisors
3100 L%=(INP(PSTART%+3) AND 128)
3110 IF (Y%=0) THEN LOCATE Y%+4,68:PRINT "(.)"
3120 IF (Y%=0 AND L%=0 AND (K%>32 AND K%<128)) THEN LOCATE Y%+4,68:PRINT "(;CH
      R$(K%);)";
3130 IF L%=128 THEN LOCATE Y%+4,1:PRINT Y%;"Baud Divisor ";:LOCATE Y%+4,50:PR
      INT "Baud Divisor ";
3140 RETURN
3999 REM Read from UART
4000 VIN$(Y%)=INP(PSTART%+Y%):GOSUB 3000
4010 IF X%=-1 THEN V%=VIN$(Y%) ELSE V%=SGN((2^X%) AND VIN$(Y%))
4020 LOCATE Y%+4,72:PRINT"      ":RETURN
4499 REM Write to screen UART representation
4500 IF X%=-1 THEN VIN$(Y%)=V%
4510 IF X%>=-1 THEN VIN$(Y%)=VIN$(Y%) AND NOT(2^X%) OR (2^X%*V%)
4520 GOSUB 3000:RETURN
8999 REM Confirmed write to UART
9000 OUT Y%+PSTART%,VIN$(Y%):LOCATE Y%+4,72:PRINT "WRITTEN":RETURN

```

rupt conventions, unfortunately, so XT drivers *still* fell over.

Meanwhile, problems were occurring elsewhere. As you may have noticed, the BIOS can recognise up to four comms ports, COM1-COM4. Unfortunately, only two IRQ lines — 3 and 4 — are allotted for serial port use. Traditionally, 1 and 3 share IRQ 3, while 2 and 4 share IRQ4 (though most adapters allow you to choose via DIP switches). But sadly, the AT's handling of interrupts is edge-sensitive: if COM3 interrupts while COM1's IRQ is being catered for, COM3 is ignored. Unless you write some very ingenious driver software, shared IRQs can't work on an AT. To work around this, most AT users use only one interrupt-driven handler at a time and poll the other ports which use that IRQ. This works, to a point. Another solution is to configure adapters to work off other, unofficially spare IRQ lines. This works too, but only on ATs (XTs only have 8 lines).

Micro Channel Architecture

Then, IBM introduced the PS/2, and Micro Channel Architecture. This provided level-sensitive interrupts, which meant the PS/2 *could* share IRQs. And IBM promptly declared all ports above COM1 to be attached to IRQ4 — the most backwards-incompatible move it could make. Officially there were no spare IRQ lines, and any new IBM drivers would presume IRQ4-sharing. The rival EISA spec included optional level-sensitive interrupts, but

few companies have implemented them.

One forward-looking step from IBM with the PS/2 was to change the UART (again). This time it was the 16550 — a major enhancement of the 16450, as it included 16-byte First-In-First-Out (FIFO) buffers on the receive and transmit registers. The UART could hold up to 16 characters before it started to lose characters, facilitating higher baud rates. The 16450 was turned on by writing a 1 to bit 0 of register 2 (previously read only). 16550s could be detected by the fact that they set bit 7 of register 2 in FIFO mode (you can try it on your system with the UART Monitor). An excellent enhancement — now PCs really *could* run at 115,200 baud.

It didn't work. The chips NS had designed, and which IBM had put into the PS/2 Model 50, 60 and the 16MHz 80s, broke in FIFO mode. NS made another hasty bug fix and released the 16550A, which *did* work, and also set bit 6 of register 2 when FIFOing, so programmers could tell the two chips apart. (Again, you should

test yours using the UART monitor.)

Sadly, clone manufacturers had produced a 16550 copy (the UM82C550), *sans* FIFO bug but which still left bit 6 unset; so programmers can't even trust that. (The only way to test your chip is to put the UART into loop mode, activate FIFO, then try and overrun the buffer by popping 16 bytes into the transmitter and seeing what comes back.)

Windows 3.0

Then came Windows 3.0. This uses interrupt drivers on all its comms ports, so if you don't have MCA or EISA, you can't touch COM3 and COM4. Moreover, it's multi-tasking, which means that it regularly freezes all interrupts while it switches contexts between programs. Which means it can lose characters, even though it's interrupt-driven. Unless, of course, it took advantage of the new, FIFOing 16550s. Then it would be able to pause, and still have time to catch up on what it's missed.

I'll leave it as an exercise for the reader to discover whether Windows 3.0 does support the 16550. Hint: what did I say big companies do?

References Jim Kyle and Chip Rabinowitz's article in the *MSDOS Encyclopaedia* (Ray Duncan, Ed, Microsoft Press 1987) is good on writing interrupt-driven drivers. For an excellent account, with code, of PC UART programming see the March 1990 issue of *.EXE Magazine* (081-994 6477).



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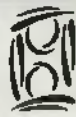
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Up, up and away

The horizons of armchair pilots everywhere have widened considerably as scenery and aircraft design add-ons, both commercial and shareware, proliferate for Microsoft's perennially popular Flight Simulator 4. Guy Swarbrick rises to new heights.



In the March 1991 issue of *PCW* I wrote about the arrival of Microsoft's Aircraft and Scenery Designer, an add-on for the ever popular Flight Simulator 4, which allowed, as its name suggests, frustrated pilots to design their own aircraft and scenery. Even then, shortly after its arrival, there was a rapidly growing collection of home-grown scenery and the collection has continued to expand. There also emerged a handful of public domain and shareware utilities and, more surprisingly, a couple that related directly to the Aircraft & Scenery Designer.

A year on, that flood of new scenery and aircraft continues unabated, and as if that were not enough, a number of new commercial add-ons to the program deserve a look. March might seem a strange time for what may yet become an annual look at the Flight Simulator scene, but bear in mind that, while this issue has March on the cover, it is on sale in early February, much of it having been written between the end of December and the beginning of January.

FS4 Macintosh

Before we get on to the new FS4 products, just a quick word about Flight Simulator 4 for the Macintosh. Long promised, I don't think Mac enthusiasts will be disappointed. The Bruce Artwick Organisation has once again done a stunning job, producing a Mac version that is every bit as good as the PC version and which gives one or two pointers to the future of the genre.

The first is that the traditional, rather quirky, menu system has gone. This is a real Mac app with real Mac menus. There are subtle touches to bring the interface into line, too. All Mac applications have a File menu, with an open option. So does FS4. Select it and a dialog appears, allowing you to open Aircraft, Mode or Scenery files. After the PC version it seems a little odd, but it makes sense after a while.

The one drawback is that you need a fast machine; the advantage is that you can take advantage of the Mac's flexibility. On the humble IIsi, with a standard colour monitor the frame rate is accept-

able but not exceptional, running under System 7. On a IIfx it is superb. Put the image full size on a 19in colour monitor and things do start to slow down. But what the hell...

Many of the features in the new Mac version will no doubt find their way into the eagerly awaited — and by all accounts, not too far off — Flight Simulator 5 for the PC. Many will also be in the long-rumoured Windows version, which again, according to rumour, may be Flight Simulator 5. Potentially best of all will be the version for Windows/NT, said to be due for delivery at the same time as Microsoft's new operating system. That will be a demo.

A&SD add-ons

Perhaps the most significant of all the new products is Mallard Software's Sound, Graphics & Aircraft Upgrade (SGA) for Microsoft Flight Simulator. Snappy name. Who is Mallard? The box says this is a product of the Bruce Artwick Organisation, but it doesn't explain why it carries a Mallard badge.

You might expect an add-on from the original authors to be something special, and you'd be right. The title gives a good indication of the relative importance of the three parts, so to build things up a little, I'll cover them in reverse order.

There are four new aircraft to add to your collection. Not just the kind of simulation you can achieve with A&SD, where the plane may fly like the one it is modelled on (but certainly doesn't look like it); these are complete simulations. The most glamorous addition, and the one chosen for the front of the box, is the unique BAe/Aerospatiale Concorde. Like the 747-400, the Lear Jet and others that have gone before it, this and the other aircraft SGA adds are not modelled to the same degree of accuracy as the Cessna around which FS4 is built. But that doesn't mean they aren't fun.

Concorde is great for achieving those transatlantic and US coast-to-coast flights you always wanted to do but never got round to, but the others can be even more fun. The 1939 Laird Turner Meteor Racer and the P-51D Mustang are both great for aerobatics, but for real fun you can't beat the odd-

looking Spectrum Beaver RX 550 Ultralight. I'd never had much interest in the crop-spraying game, but the Ultralight changed all that.

OK, that's the worst bit over with. Now for the graphics. Let's get the bad news out of the way first. If you have any sort of VGA card other than ATI VGA WonderPlus or XL, Video 7 1024i or FastWrite or a card based around the Tseng 4000 chipset, all you'll get is a 640 x 400 true VGA display instead of the old, EGA 640 x 350 version. No big deal: there are a whole load of new cockpits for your aircraft, including the superb 'glass cockpit'.

The best of the drivers gives you an 800 x 600 display. I'm not quite sure why the authors have limited these modes to a handful of cards since most modern VGA subsystems will operate in the standard SuperVGA 16-colour mode at this resolution. All the supported cards are capable of providing 800 x 600, 256-colour displays, but this capability is not used.

Compass display

Even so, the quality of the 800 x 600 display is stunning. Admittedly, the tests were carried out on a 33MHz 486, but the frame rate with the Tseng chipset was perfectly acceptable. The new cockpit display is the closest yet to a real aircraft instrument panel and is the easiest to use. The compass display is particularly impressive.

Regrettably, the Sound section is not very good. Supporting Sound Blaster, ATI Sound FX, Covox Voice Master and Adlib, it provides sound effects for engines, landing gear, warning sirens and so on. They really are quite poor. Compared to the pathetic offerings from the PC speaker, though, they are incredible. The Sound Blaster also provides passable speech synthesis from the Air Traffic Controllers and your flight instructors.

SGA isn't for everyone. At £40, you really need to have a sound card or one of the supported video cards to justify it. The aircraft are good, but it's a lot of money for four of them and an extra 640 x 50 pixels that you hardly notice. If you have both cards, it's a real bargain.

Shareware

SEE, the shareware scenery enhancer I mentioned in the last article, has reached version 3. Still damn difficult to use, it nonetheless gives you an enormous amount of control over scenery features and in particular over runway lighting schemes, for which the Aircraft & Scenery Designer is justly infamous.

There is a solution for those of you who desperately want to use the power of SEE but can't get to grips with the script language. SEE 4 comes with a SEE Shell, which really does make things easier to use.

SEE isn't a scenery designer. There are things you can add with it that ASD can't, but you really do need to have designed your scenery before you use the Special Effects Editor. If you want realistic nighttime landscapes, taxiways and buildings, this is the only sensible way to go about it.

But there's a drawback: SEE 4 is no longer shareware. The authors have decided that there is enough demand for this version that it can stand on its own two feet as a piece of commercial software.

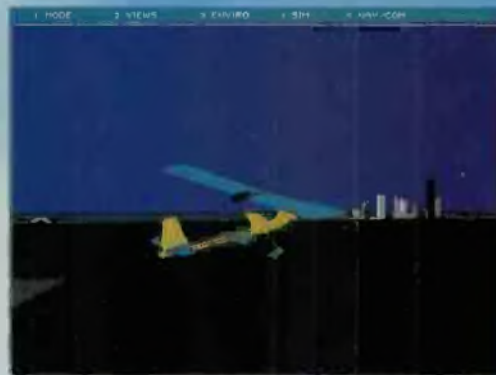
I think they may be right. Hopefully, the next version will have object-oriented extensions and will be known as SEE++.

Scenery

Last time, I wrote about the Western European Scenery Disk as the most interesting of the huge collection of scenery available from Bruce Artwick's old company (and author of the original Microsoft Flight Simulator), subLOGIC. Throw it away, or at least put it to one side. The company has now released the GB Scenery Collection which covers the whole of the UK. The documentation and the maps are greatly improved and there is even a cardboard flight computer.

The level of detail is surprisingly good, with Central London and the Docklands covered in most detail and a huge number of landmarks included across the length and breadth of the nation. Some of

▼ The unexpected star of the Sound, Graphics & Aircraft upgrade — the Ultralight



the reference material, however, seems to have been rather inconsistently chosen. The rumoured Brands Hatch with dynamic scenery used to simulate a race in progress is not, unfortunately, present (although it would make an excellent if relatively advanced project for A&SD junkies). Silverstone is there, sans cars but with the infield runways. The circuit is the new, 1991 layout (the one that transformed the circuit from a dull, flat airfield perimeter road into a dull but not entirely flat airfield perimeter road). Very impressive; but why is most of the top half of the M25 missing?

One of my major grievances with the Western European Scenery Disks was that some significant geographical features were missing. The Thames was there, but its close neighbour, the Medway, wasn't. It is now, in magnificent detail. Fly between the Isles of Sheppey and Grain and through the estuary and you pass across a fair representation of

△ One of the new cockpits in glorious 800 x 600 16-colour mode



▽ **Tracon for Windows** adds a whole new dimension to ATC simulation

the small islands and marshes which clutter its centre. Keep following its twisted path and you'll come to the M2 motorway bridge and on until the scenery disk river peters out around Aylesford. Lots of things are missing. Rochester Castle and Cathedral would have been nice, and the huge, artificial basins of Chatham Dockyard which fill the inside of one of the river's tighter bends. Most importantly, the Americans have, rather oddly, omitted Priestfield Stadium, home of Gillingham Football Club. Now, where did I put those Ordnance Survey maps?

Even more impressive is the fact that the second



△ **Concorde** — the simulation is far from perfect, but that doesn't stop it being fun

set of scenery disks included in the package, those for subLOGIC's ATP, have an even greater level of detail. Most of the additions are in terms of navigation aids, but there are land features and dynamic scenery present in ATP that you won't ever see in FS4.

Good though they are, the GB disks aren't perfect. Cramping so much in has meant that there are three scenery files, covering southern, central and northern Britain. Using the automatic selection option should mean that this isn't a problem. If you have the Western European Scenery Disk installed, however, the automatic selection system grinds to a halt. It knows you've left one area, but seems to have trouble deciding whether Western Europe or the next GB scenery file is the correct one. I solved the problem by deleting Western Europe, but that can't be the best solution.

More frustrating is the fact that the coordinate system used for the two conflicting sets of scenery is slightly inconsistent. Scenery you have painstakingly positioned for Western Europe will be in the wrong place with the GB Scenery Collection.

That will cause you problems if you've gathered a collection of PD scenery, or if you've bought third-party add-ons like the North West and North East England scenery packs from Flight Simulations of Bury, Greater Manchester. Developed using A&SD these scenery additions work fine with the Western European disks, but not with the GB collection. That's a shame, because many of the airports mod-

elled aren't covered in the subLOGIC collection.

I'll get back to Flight Simulations' scenery in a moment, but there is another problem with the GB Scenery Collection. Stonehenge, HMS Victory and the four buildings that allegedly make up Manchester are present, but there are no airport buildings at all, not even a control tower at Heathrow. After all the effort that has been put in to the rest of it, lack of realism at the big airports, particularly, is a little hard to understand.

Normally, the modelled areas in Flight Simulator scenery are based on dozens of aerial photographs, large-scale maps and so on. For the GB collection, it seems, an old aviation chart was enough. The familiar 'Star of David' pattern to Heathrow's runways is replaced by the two main runways and the single minor runway that are shown on the Jeppesen chart.

Despite that, the GB Scenery Collection is the ideal first add-on for a new Flight Simulator pilot and an essential purchase for experienced arm-chair aviators.

New Facilities Locator

To find your way around all this scenery you need a little help. subLOGIC once produced an accessory called the Instant Facilities Locator which would help you find a particular location on a scenery disk. It wasn't very good, however, and has been replaced by the imaginatively titled New Facilities Locator.

Referred to in the manuals as the NFL (a title which I'm sure could get subLOGIC into a certain amount of trouble with America's National Football League™) this unsophisticated yet invaluable add-on takes an age to install, particularly if you have ATP as well as FS4 installed. It contains details of all the current scenery disks, with the current exception of the GB Collection. There are files on the GB disks, though, to bring it the attention of the NFL (as opposed to the NFL™).

The only immediate difference you'll notice is that menu 5, the navigation menu, has an extra choice, 'G - Facilities Locator'. Using the NFL isn't as easy as it might be. There are several nested menus and FS4's odd menu system makes navigating through them hard work. An instant facilities locator for the instant facilities locator would be useful.

It's pretty intuitive, really. Select G, then press Ins. That brings up a list of scenery disks (the default is that for the default startup mode) and pressing the space bar will move you on to the next menu. Pressing Return will select the scenery disk, too, but it will also dump you back to the main FS4 screen.

Once you've selected the correct disk, a list of features will be displayed. You can select the types of features to show from a list that includes airports and navigational aids. You can scroll through the features, but there are a lot of them. If you know what you're looking for, press the Alt key and type its name. If you select an airport, you'll get yet another menu to allow you to choose a runway. You won't, unfortunately, get the chance to choose your orientation on that runway.

Still, you can't have everything. The NFL is not for everyone. You have to make pretty heavy use of

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▽ Like everything else that's been tacked on to FS4, SGA's menus are awkward to use

your scenery collection to justify yet another £40 that is bound, eventually, for Illinois. But if you need it, you need it bad.

If Flight Simulations puts together an NFL file for its North East and North West England scenery, you'll be able to use those with the NFL, too. Having designed some scenery myself, I can appreciate what the designer went through to produce these disks. All the obvious stuff is there. Manchester is on both disks, and major airports like Liverpool and Leeds are only to be expected. Hutton Cranswick and Pocklington are a nice surprise, however. There are over 30 airports on the North Eastern disk, including six fictional sea plane bases for your Cessna.



△ 640 x 400 mode provides nothing more than an extra 50 lines on the display, but it's all you'll get with a standard VGA card

Tracon for Windows

Not really an FS4 add-on, Tracon is an air traffic control simulator based on a real, commercial ATC trainer. The latest version, which runs under Windows and simulates both civil and military control work, is far more impres-

sive than its predecessors.

Challenging though they were, the earlier versions suffered from a rather odd user interface. I did a couple of brief experiments with the DOS version, then left the box gathering dust. This time, I've become completely addicted: in the Windows version, everything makes sense. The challenge of developing a flight plan for 20 or more targets moving in three dimensions is a satisfying and endlessly repeatable one. The fact that you can link up to four PCs running Flight Simulator 4 to the controller's PC just adds to the enjoyment. You won't find many games, even at £44.95, that can keep you busy for as long as Tracon will.

Hardware

The most unusual of all the add-ons and potentially the most fun is the ThrustMaster Weapons Control System (WCS). Weapons? In Flight Simulator?

Happily not. The rather unfortunate name comes from the fact that the controller also works with Microprose's Strike Eagle II, F-19 (and F-117A) Stealth Fighter; Spectrum Holobyte's Falcon AT, Flight of the Intruder and Falcon 3 (see next month's 'Screenplay'); Dynamix' A-10E Tank Killer and Red Baron; Lucas Films' Their Finest Hour, Battlehawks and Secret Weapons of the Luftwaffe; Origin's Wing Commander; Velocity's Jet Fighter - The Adventure I and II; Activision's F14 Tomcat; Electronic Arts' Yeagers AirCombat, and subLOGIC's ATP. If you don't have any of those, you're reading the wrong article.

So what does it do, and considering how many different programs of different vintages it works with, how does it do it?

The WCS looks at first sight like a joystick with an obese top end and an insane number of buttons. In fact, it is essentially a throttle control with buttons for a variety of different functions, depending on the game concerned.

There are seven switches in all. Three, on the top, front surface of the stick are controlled by the fingers, one falling directly under the middle finger and two under the index finger. The rest curve around the side and are activated with the thumb. Three are simple push-buttons, the third a three-position rocker switch.

In Flight Simulator, the three top/front switches operate the Nav and Com radios and the transponder, the thumb switches the lights, strobe and brakes, and the rocker switch controls carb heat and landing gear, with the middle position not performing any function.

How can it be so flexible? The WCS is actually a keyboard. A set of DIP switches selects the program you're running and the controller plugs into your keyboard socket. Plug the keyboard into the WCS and you're away. All the controller does is send the appropriate keystroke to the PC, just as though you'd typed it. Simple, but effective. With a joystick and the WCS, as well as a pair of Maxx pedals, I find Flight Simulator far easier to fly than with a conventional yoke. I guess I'm just a fly-by-wire jock at heart...

Taking flight

It's been a great year for Flight Simulator fans. The next year promises to be even better. I suspect we won't see quite so many new commercial products appearing, with the possible and welcome exception of the Windows version, but expect the public domain and shareware offerings to continue appearing at a steady rate.

The big problem with the commercial add-ons is that, like the simulator itself, they tend to be rather high priced. Add to that the fact that UK importers of products not officially distributed here have to make a living somehow, and you're left with an unpleasant bill.

Thanks to Flight Simulations of Bury (061-761 1902) for supplying the North East England Scenery Disk and to Software Circus (071-436 2811) for the GB Scenery Collection, the New Facilities Locator, Sound, Graphics & Aircraft, and the ThrustMaster Weapons Control System.

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NEW RELEASES

Here are a few of the new titles we have received recently. We have hundreds more so if you don't see something listed, phone us to see if we have it.

MARKETEER (2 discs) (HD) Complete sales system.
YEAR PLANNER (1) People's office Wall Planner.
TIME TRACK (1) Work scheduling system.
INVOICE MASTER (1) UK Invoicing system.
MR LABEL (1) New label making program.
LASER LETTERHEAD PLUS (2) Uses HP fonts & PCX pics.
TOOLS NUMBERS SELECTOR (1) Football Pools selection.
VIRUS CENTRAL (1) Menu driven system for McAfee's tool.
WINDOWS 3 CONFG. GUIDE (1) Correctly install Windows.
WINDOWS GAMES 4A (1) 7 solo games.
WINEDIT (1) Text editor for Windows programmers.
WORLD WAR II (1) Big three very detailed game.
ARCTIC ADVENTURE (1) Search for Viking treasure.
DESERT STORM (1) Slide show info on Gulf conflict.
SAMPMAN LIVES (1) (EGA) Up for your arcade game.
ZZT (1) Addictive problem solving game.
ASTRO-HEALTHY (1) Vitamins/Minerals for Astrological signs.
HISTORY HELPER (1) Hourly astro. for day, time & place.
SHOWPARTNER LITE (2) Creates superb presentations.
EXECUTIVE DIRECTOR (2) (HD) DOS shell/file manager.
DISKTRIE (1) (HD) Friendly front end for DOS.

WORD PROCESSING

PC TYPE 4 (4 discs) (HD) Latest version from Buttonware.
GALAXY LITE (1) Wordstar compatible/drop down menus.
THESAUR PLUS (1) (HD) Good pop-up, use with your W/P.
STYLE CHECKERS (1) Checks the readability of text.
SIGNSMITH (1) Create letterheads/posters/logos/pics.
LO (1) Dot Matrix print enhancer, fonts, print-spooker etc.

DATABASE MANAGEMENT

PC FILE 5 (3 discs) (HD) Powerful D/Base III compatible.
FILE EXPRESS v5 (4) Powerful, but easy to use.
FREEFILE (1) Easy to learn menu-driven database.
ZEPHYR (2) (HD) Easy to use fully relational D/Base.
WAMPUM (1) Fast, fully relational. Great Value!
CLUB (1) UK club membership program.

INTEGRATED PROGRAMS

ALT (1) (HD) Editor/calculator/address book/calendar etc.
FRIDAY (1) (HD) Super pop-up Organizer/diary/notebook.
ACTIVE LIFE FOR DOS (2) Calendar, appointments, dialler.

PAINTING/DRAWING

FRACTAL GRAPHICS (1 disc) PCX drawing using Fractals.
VGA PAINT (1) Excellent VGA graphics/drawing program.
DESKTOP PAINT (1) (HD) (EGA or Hercules) Superb B/W.

DESIGN

CHARTS UNLIMITED (1 disc) Flowcharts/electrical/Gantt etc.
EASYDRAW (1) Technical drawing, flowcharts, diagrams.
DRAFT CHOICE (1) Accurate, easy to use CAD program.
PC-DRAFT II (1) Full A4 150 dots per inch drawings.

GRAPHICS UTILITIES

GRAPHIC WORKSHOP (2 discs) (HD) Converts/scales/viewers/dithers and prints many picture formats.
ICONVERT (1) Converts many formats + screen preview.

SPREADSHEETS

AS-EASY-AS (1 disc) Famous 123-style spreadsheet.
TUTOR 1-2-3 (1) Interactive tutorial for 123 beginners.

CLIP ART

OFFICE IMAGES (1 disc) Light hearted, choose PCX or MAC.
COOPER SET (2) 1500 pictures. Choose: PCX/IMG/MAC.
DECORATIVE DROP CAP (1) Decorative capitals in PCX/IMG.

BUSINESS

LEADMATE (1 disc) (HD) Complete sales office system.
MANAGEMENT TRAINING (1) Thorough training program.
BUSINESS LETTERS (3) 600+ letters in ASCII format.

FINANCE

FREEMAN CASHBOOK (3 discs) Profit & loss/VAT/bank rec.
PAGE FINANCE CONTROL (2) (HD) Leading finance package.
FREEMAN LEDGERMASTER (4) Major integrated system.
HOME FINANCE MANAGER (1) Keeps your home accounts.

DOS UTILITIES

McAfee VIRUS TOOLS (2 discs) Anti-virus programs.
POWERMENU (1) (HD) Friendly menus, easier than DOS.
AUTOMENU (1) (HD) Run programs with single keystrokes.
PC DOS HELP (1) Highly rated DOS tutorial/detailed refs.
PKZIP/PKUNZIP (1) Fast and efficient archiving program.
PKZMENU & PKLITE (1) Two utilities for PKZIP.
HYPERDISK (1) (HD) Disc caching to speed up your system.

PROGRAMMING

C TUTOR (2 discs) Excellent tutorial with examples.
PERSONAL C COMPILER (1) Best shareware compiler?
A86/D86 (1) Fast Assembler/debugger.
B086 TUTOR (1) Intro to Assembly language programming.
TURBO PASCAL TUTOR (2) Very good tutorial.

HOBBIES & INTERESTS

FAMILY TREE (1 disc) Prints charts or book with index.
BROTHERS KEEPER (4) Friendly. Prints sideways charts.
SOLVER (1) Crossword, anagram & word square solver.
FOOTBALL FORECAST (1) Popular pools/fixed odds system.
PUNTER'S PAL (1) UK Horse racing analysis program.

GAMES

SOCCER GAME (1 disc) Get your team to the First Division.
GOAL (1) International soccer management.
PC PRO GOLF (2) Golf simulation. Quite good CGA graphics.
GRAND PRIX (1) Manage a Formula One team.
FORD SIMULATOR II (2) Test drive a Ford car.
INSANITY (1) Fantastic maze game. Needs colour.
DRACULA IN LONDON (1) Good graphic adventure game.
GET LUCKY (1) Collection of harmless (18+ only) games.
SLEUTH/HANGMAN (1) Find the murderer!
BACKGAMMON (1) Plus Cribbage & Draughts. Very good!
POWERCHESSES (1) Super chess game. Works on all graphics.
CASTLE MASTER (1) (CGA) Rescue your twin.
PHAROAH'S TOMB (1) (CGA) Raiders of the Lost Tomb.

EGA/VGA GAMES

VGA SHOOTING GALLERY (1 disc) 7 shooting competitions.
EGA ARCADE (1) 6 games including Mazewar & Shuttle.
EGA MAJONGG (1) Super graphics, can design your tiles.
CUNNING FOOTBALL (1) American football simulation.
DARK AGES (1) (286) Supports AdLib/Sound Blaster cards.
GLOBAL WARFARE (1) UK written, RISK-type game.
COMMANDER KEEN (1) One of the best ever PC games!

EARLY LEARNING

HOORAY FOR HENRIETTA (1 disc) Maths for 5-12 year olds.
HENRIETTA'S BOOK OF SPELLS (1) Spelling for age 7-14.
AMY'S FIRST PRIMER (1) Pre-school educational games.
PC LEARNING GAMES (4) (EGA) Maths, Words etc (2-9yrs)
ANDY'S WORD GAMES (1) Improve spelling & grammar.
FUNNELS & BUCKETS (1) Games for age 2 to 10.
MONKEY BUSINESS (1) (mouse) Interactive story (age 7-10)

EDUCATION

PC TUTOR (1 disc) Good interactive computer tutorial.
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Marked improvement

SGML, an Open System for marking up text for printing, was a bestseller when first published in 1986 because it could save publishers (and the Pentagon) a lot of money. R Lee Humphreys explains how and why — and predicts that we will hear more of it.

Before I start, let me check that you are the right sort of reader. Interested in big-time text handling of rather important documents? If so, this is definitely for you. Interested only in bashing off the occasional letter to Aunt Mary, thanking her for those lovely purple socks? Then I am afraid you are likely to be disappointed. You are just not big enough for Standard Generalized Markup Language, the subject of this article. Sorry. But keep on reading, because you'll find out how the other half lives.

SGML became an international standard (ISO 8879) for text markup in 1986. (Don't worry if you don't know what text markup is, you'll find out real soon now.) Intellectually speaking, the usual international standards tend to be pretty boring. They give definitions ('Ice Cream contains Dairy Cream') and tolerances ('at least 20% by weight at 20 degrees Celsius'). They state what is, or ought to be, obvious and agreed. The only excitement you can hope for is the political fallout, such as screams from diehard crazies who think that our traditional British Fake Vanilla Frozen Pig Fat deserves to be called Ice Cream, just as much as the Great British Banger (90% sawdust and other stuff normally resident between Porky's toenails) deserves to be called a sausage.

SGML dares to be different. It's not politically

contentious, but it isn't boring either. It doesn't state the obvious or merely codify existing practice. Rather, it offers a way of thinking about text and text processing which is clever and correct. (How do I know? Let me quote an old Essex saying: 'When you've seen the light, you've seen it.' Orrright?) What's more, SGML gives text producers complete independence from vendors and technologies.

Let's work through a couple of examples to see how it works. The first is a standard office memo; the second is an English dictionary entry. Like all standard documents, they have a logical structure. A memo starts with a piece of text saying whom it is to, another saying whom it is from, and a body — the piece of text which constitutes the meat of the memo. There may or may not be a closing (Yours...) at the end. For a proper memo, rather than an article or book posing as a memo, the largest sub-element of the body is a paragraph. An element is SGML-speak for a component in the logical structure of a document.

The logical structure of a standard memo differs from, say, a standard business letter in that the latter has full sender and receiver addresses, an obligatory opening (Dear Sir) and an obligatory closing. Fig 1 shows what a particular memo — an instance of the standard memo type — might look like when marked up with SGML.

Fig 1 Standard memo in SGML

```
<Memo>
<To>Mary Saint, Purchasing</To>
<From>Ed Coote</From>
<Body>
<P>We would like to order 4 Sun ELCs with an additional 8Mb of memory. We don't
  need any external drives.</P>
<P>By the way, have you managed to get any more info on SGML parsers for PCs? Or
  on SGML parsers for anything?</P>
</Body>
</Memo>
```



```

<Entry h=abandon hn=1>
<Headword>aban|don</Headword><Pron>@"b\&nd@n</Pron> <PartofSpeech ps=vt>
<Sense sn=1 vp=6A>
<Def>go away from, not intending to return to</Def> <Def>forsake</Def>
<GlossedEx>The order was given to <HeadwordRef>ship<esn>for all on board to
leave the (sinking) ship</esn></GlossedEx>
<VanillaEx>The cruel man <HeadwordRef>ed his wife and child</VanillaEx>
</Sense><Sense sn=2 vp=6A>
<Def>give up</Def>
<GlossedEx>They <HeadwordRef>ed the attempt<esn>stopped trying</esn></GlossedEx>
<GlossedEx>They had <HeadwordRef>ed all hope<esn>no longer had any hope</esn></
GlossedEx>
<VanillaEx>The new engine design had to be <HeadwordRef>ed for lack of financial
support</VanillaEx>
</Sense><Sense sn=3 vp=14>
<InflectionPat><HeadwordRef> oneself to</InflectionPat>
<Def>give oneself up completely to, eg passions, impulses</Def>
<VanillaEx>He <HeadwordRef>ed himself to despair</VanillaEx>
<Derivative><DHeadwordRef>ed<PartofSpeech s=part_adj>
<DSense sn=1>
<Def>given up to bad ways</Def> <
Def>depraved</Def>
<Def>profligate</Def>
<VanillaEx>You <HeadwordRef>ed wretch!</VanillaEx> </DSense>
....
</Derivative>
....
</Entry>

```

Fig 2
Dictionary
entry for the
word *abandon*
in SGML

Tags

In addition to the actual text of the memo — the text that will appear when it is printed or displayed in some way for an ordinary reader — you can see various paired SGML tags delimiting the memo elements. Thus the memo as a whole starts with `<Memo>` and ends with `</Memo>`, the use of a backslash to indicate closing delimiters being pretty much the SGML norm. In between the tag pair we find the sub-elements of the memo, also marked up with paired tags (`<To>...</To>`, `<From>...</From>`, `<Body>...</Body>`).

Memos are simple; dictionaries are not. Fig 2 shows the entry for the word *abandon*, adapted from an SGML-marked electronic version of the Oxford Advanced Learner's Dictionary of Current English 3rd ed (OALD).

We'll come back to some of the tricky bits later. For the moment note that the general structure of the entry consists of the headword (`<Headword>`), and a definition (`<Def>`), and series of examples (`<VanillaEx>`), or glossed examples (`<GlossedEx>`), for each sense of the headword.

There is a very important point about the markup in both the memo and the dictionary entry: it says nothing about typographic rendition. It doesn't say, for example, that definition sentences should be printed in Times Roman or that the headword should be printed in bold. So if I markup the logical structural elements of a memo or dictionary entry I can leave the decision about its appearance to someone else.

In other words, SGML envisages that the author of a document has responsibility only for writing the text and showing how s/he thinks each bit of text fits into the document structure; rendition of the text is left for some other person, place or time.

This is what descriptive or intensional markup is all about: tell me *what* it is rather than *how* you want it to be.

Document types

The memo and dictionary entry are instances of particular document types. To mark up any document type consistently, we need some means of specifying its structure. For example, we may want to declare that all memos have to have From and To elements. SGML provides a syntax for writing Document Type Definitions (DTDs) which do just that.

A DTD is a roll-your-own grammar for marked-up documents. (Strictly for techies: it defines LL(1) languages.) A publisher about to compile the first-ever multilingual Dictionary of Text Processing in all nine official EC languages, would need a DTD grammar specifically designed for the job (or a modified version of an existing DTD).

The principle software tool for SGML work is a parser, which checks that a document conforms to a DTD. The parser will scream if the syntax or sequence of markups is awry.

This shows again that SGML is not for the casual user. If you are writing a series of complicated aircraft maintenance manuals, SGML ensures that each has the same structure as all the rest. But it's a waste of time for your one-off thank-you letter. (That's a bit unfair: with good SGML tools, there wouldn't be time or pain penalties. But there wouldn't be much point either.)

Attributes and entities

So far we have concentrated on the notion of text elements, and their associated tags and DTDs. There's much more in the SGML toolbox. You can give attributes and values (also declared in the

A Document Type Definition

This DTD defines a class of office memos:

```
<!-- DTD for an Office Memo - Adapted from Herwijnen, van (1990)p30 -->
<!ENTITY % doctype "Memo" - Document type generic identifier ->
<!-- ELEMENTS MIN CONTENT (EXCEPTIONS) -->
<!ELEMENT Memo - - ((To & From), Body, Close?) >
<!ELEMENT To - O (#PCDATA) >
<!ELEMENT From - O (#PCDATA) >
<!ELEMENT Body - O (P+) >
<!ELEMENT P - O (#PCDATA) >
<!ELEMENT Close - O (#PCDATA) >
<!-- ELEMENTS NAME VALUE DEFAULT -->
<!ATTLIST Memo STATUS (confid|public) public >
```

Each declaration is opened with `<!--` and closed with `>`. The comment delimiter is `---`. The ENTITY declaration says that the overall document type is a Memo. The ELEMENT declarations describe the logical structure of the Memo document. The first such declaration says that a memo consists of a To element and a From element (in either order) followed in sequence by the Body of the memo and an optional Close. Further down, the declaration for Body states that it in turn consists of one or more (that is, +) paragraphs (P).

The paragraph declaration says that it consists of PCDATA — characters which can be safely parsed by the SGML parser. (The DTD could have said here that paragraphs consist of sentences which in turn consist of PCDATA. However, the punctuation system provides perfectly adequate conventional sentence delimiters — fullstops and capitals.)

The memo element has an attribute STATUS which takes values confidential or public. This information could be used to control display and/or distribution.

The entries under MIN indicate whether or not the closing tag can be omitted. In this case, only the memo close tag is obligatory.

A DTD for our dictionary would be much more complex than this.

DTD) to individual text elements. Looking back at the dictionary example, we can see that the *part of speech* associated with the *headword* is coded as the value of a *ps* attribute inside a tag:

```
<ent h=abandon hn=1>
<hwd>aban|don</hwd>
<pr><ph>"@b\&end@n</ph></pr>
<hps ps=vt>
<han sn=1 vp=6A>
```

The `<hps>` tag exists solely to carry this attribute; the designer obviously decided that because the part of speech is a one or two character code drawn from a small list (for example, vt for transitive verb, vi for intransitive verb, n for noun and so on) there is no point in expressing it as a piece of delimited free text.

As usual, SGML doesn't say how the attributes and values are to be used in the text display and processing system. All it does is to define a syntax so that it can be recognised by any conforming SGML system.

SGML has specific reserved words to allow for standard types of differential processing. Supposing we wanted to keep bits of original text next to their revised versions inside the same document. Normally we would require only the latest versions to be displayed or printed — which can be done by marking the older sections with the reserved word IGNORE:

```
... bits of text. <![ IGNORE [ Every
thing in this section is a total lie,
by the way.]] > <P> And now....
```

In addition to elements, SGML is concerned with entities, which may be internal or external. Internal entities are used as character references or string macros. For example, `é` is not in the standard ASCII character set but we can refer to it throughout

the document as, say, `´` or `É`; or we can use an entity reference as a short way of referring to a whole string:

```
<!ENTITY SGML "Standard Generalized
Markup Language">
```

```
...
...
```

Entity references in &SGML; can save typing and ensure consistency...

The text line would be displayed or printed as: 'Entity references in Standard Generalized Markup Language can save typing and ensure consistency...'. Another variety of entity reference helps abbreviate DTDs.

External entities are usually files outside the current document. For instance, each chapter of a book may be in a separate file, which itself is associated with an entity declaration in the DTD. The SGML processing system uses such references to pull chapters from the files.

Documents

The notion of document includes much more than mere text, of course. External entity references allow non-SGML files, such as bit-image or graphics or whatever, to be picked up and put in the right places without sending the SGML parser into hysterics. For example, the following declaration puts in an Encapsulated PostScript diagram:

```
<!ENTITY MYDIAG SYSTEM"/my_book/diag.eps"
CDATA EPS>
```

The (external) entity declaration says that MYDIAG references an EPS file which consists of genuine character data (CDATA) which is not parsable by SGML systems. *Ergo* no crash. One advantage of external entity references is that all system-dependent references are kept together with the 'front of document' material rather than being

scattered through the text.

Another SGML-related standard (ISO 9069) describes a nice interchange format into which SGML documents are packed for exchange between systems. An important function of a packer utility implementing this standard would be to pick up each of the entities from their separate storage locations, label them, and then kick them out with the rest of the document into the stream. An unpacker utility at the other end is supposed to undo the packer's work. If I reference my pretty diagram four times in the middle of the document, the cunning SDIF packer will only send the PostScript stuff once and keep the remaining three references as references, thus cutting Telecom revenues to a mere one quarter of what they might have been.

Another sort of external entity (which never gets packed for interchange) is public text. Typically, this is a DTD which has been declared public domain and registered with the standards authorities (that's right, another standard: ISO 9070 specifies the official registration procedures to be followed). Thus that wonderful nine-language technical dictionary DTD might get put into the public domain for the greater good of mankind and publishers everywhere.

Public text can also be your actual real text, such as the standard legal boilerplate that would go into the front of nine-language technical dictionaries telling everyone that they shouldn't even think of reproducing all or part of the dictionary unless their chequebook is open and ready. Or it could even be the entire works of Shakespeare (handy for incorporation into a rather large document containing the entire works of every European author since the year dot).

This emphasis on public text and formalised registration procedures shows again how SGML is pitched as Open Systems for text. If there really is to be a global village, SGML is geared up to provide all its printed stationery.

Using SGML

The great and good lawgivers of SGML (such as Charles Goldfarb from IBM) always intended that SGML markup should be readable by humans. And so it is — if you're the kind of wacky fellow who thinks that PostScript and other such gobblede-

gook is human-readable too. I'm not. To me, every last wretched character of SGML deserves to be locked up out of sight before it frightens the ordinary punter and his horses.

If you really want, you can type in everything (including the DTD) with your favourite word processor running in ASCII mode, and then push the result through an SGML parser to catch the errors. But that isn't how it should be. Firstly, DTD design is a job for the specialist; it is not something for the author or typist of a particular document. (A fairly ordinary DTD for a textbook can easily run to over 1000 lines of SGML declaration code.)

Secondly, typing in tags and parsing on completion is unnecessarily primitive. A good SGML editor tool ought to be able to provide on-line guidance as to document structure and where you are in it. No separate parser or parse phase would be necessary. For example, if you are writing a dictionary entry, the editor should make it clear with some intuitive graphic interface that you have now written the headword (say), and its part of speech, and the next thing you need to write will be the definition.

As you pass from element to element, the editor inserts appropriate opening and closing tags which — unless the author chooses otherwise — remain hidden from the text on view. The author or typist need never know anything about SGML, or even that SGML is being used. In short, SGML can function to control the behaviour and mark up the output of a WYSIWYG processor.

The basic SGML standard says absolutely nothing about how an SGML marked-up document is supposed to be turned into a typeset or displayed document. SGML does have a syntax for putting in the occasional processing instruction (for example, page break control) but this is strictly for emergencies induced by feeble typesetting software. Somehow all those marked-up elements have to be associated with font changes, tabbing, centring and so on and so forth.

What mostly happens at the moment is that the local SGML guru writes a table saying how each particular defined element is supposed to be typeset (for example, for the dictionary, headwords are bold, parts of speech in sans serif). An application program is then written to read through the markup and spew out appropriate typesetting commands in accordance with the table.

Alternatively, some SGML parsers can be persuaded to output user-defined typesetting (or anything else) commands as they parse — but the SGML standard does not say anything about how this interface with the parser (its application language) is to be constructed.

The ISO people recognised some time ago that there should be some standardised way in which the 'style sheet' for an SGML document could be written. This would be an extra layer on top of SGML called DSSL ('Document Style and Semantics Specification Language', if you must know). Above this there would be yet another layer for a

"The lawgivers of SGML always intended that its markup should be readable by humans. It is, if you think that PostScript and other gobbledegook is human-readable too"

SGML and databases

SGML provides an ideal tool for linking text to databases. Marked-up individual elements are clearly delimited for extraction by database loading or updating programs. For example, it is easy to find and extract all definitions in the English dictionary because they are unambiguously distinguished from examples.

Structured SGML documents can be systematically decomposed into a set of relational database tables forming a sound basis for full text storage and retrieval (see van Herwijnen (1990) pp 209ff for details).

page description language (PDL), ready for interpretation by a printer or a workstation screen.

It is generally understood that the PDL, when it arrives, is to be some subset of PostScript — so that's OK. We're still waiting for DSSL, but an extension to SGML called HyTime (see box below) is sufficient for most people in the industry.

Who is using SGML?

When it was published in 1986, SGML was reputedly one of the fastest-selling ISO standards of all time (true, that doesn't say much.) The bandwagon was kick-started by the US military, which had a problem with user manuals for its toys. There are an awful lot of toys and the manuals cost an awful lot of money (a weighty problem: the average warship packs 15 tonnes of user manual).

SGML was drafted in to ensure that documentation could be freely distributed between Pentagon people, their suppliers, and the sailors at the sharp end. Pentagon people issue DTDs for various manual types; every supplier manual instance must conform to the appropriate DTD. Not very surprisingly, the Interleaf package — an industry leader for technical document authoring used by lots of engineering outfits — will now produce SGML output.

The two other principal players are publishers and governmental organisations. Publishers (particularly in America) have managed to agree on various book DTDs and these are now publically registered. The most committed users are those who have spent a lot of time and money assembling material for publication and are desperate to ensure that their investment is future-proofed against any possible changes in delivery technology. SGML's combination of structure-control and total vendor

and medium independence has meant that dictionary publishers, who spend millions on preparing each new product, are ardent devotees.

Text databases are also natural candidates for SGML. In the UK, an outfit called Chadwyck-Healey is working on a CD-ROM database of every published English poem since 600AD. Of course, the markup will be invisible to ordinary users because it is only used by the retrieval software to display the poems. But it is always lurking in the background:

```
<poem n=VII rhymed=y>
<head>PRIMROSE TIME</head>
<stanza>
<l><hi r=smcap>This</hi> world was
  formed for maid and man;
<l indent=1>So each must find a fel
  low.
<l>It hath been so since the world
  began,
<l indent=1>And marigolds were yel
  low.
</stanza>
```

(By the way, those indent attributes and so on are not necessarily formatting instructions. They are *descriptions* of the original published format kept in because some people consider that this is part of the poem itself.)

Despite the size and complexity of their poems project, Chadwyck-Healey's Editorial Director, Alison Moss, tells me they are managing fine with a basic shareware parser.

The real SGML obsessives are EC organisations such as the Commission. They like SGML's grandeur of vision, its openness, and the fact that it can be made to work smoothly with different languages and character sets. International scientific organisations such as CERN are equally enthusiastic. I also have the impression that lots of Dutchmen are in on the act, probably because the Dutch read and write in several languages and support the largest per-capita publishing industry on Earth.

SGML is big and getting bigger. But it perhaps hasn't so far quite been the rip-roaring super success that people thought it might be. One problem is that because it encourages a new way of thinking about document production, there is no shortage of professionals who simply don't understand it. And the failure of systems vendors to provide ready-to-run off-the-shelf SGML-based publishing systems hasn't really helped. Great ideas can take years to sink in. It was 20 years for Unix. I bet you SGML will do it in half the time.

Hypermedia and Hytime

SGML is designed to handle documents which contain non-text entities such as graphics or binary. It also provides support for self-reference in documents by providing individual elements with identifiers and identifier references, so it is very suitable for hypertext applications.

SGML's hypermedia capabilities have been beefed up in a soon-to-be-standard extension called HyTime. Although it started out in life as a specific set of standards for representing music, it was soon realised that these could be generalised for multimedia. HyTime provides:

- SGML itself
- Extended Hyperdocument management facilities, including support for various types of hyperlink.
- A Coordinate Addressing Facility which positions and synchronises on-screen events. This allows authors to specify how hypermedia documents are to be rendered.
- Better version-control of comments and activity-tracking policy support.

HyTime has been adopted as the basis for hyperlinking in the US Department of Defense's Interactive Electronic Technical Manual project (offering fancy CD-ROM hypermanuals on *Jacking and Towing your Tank* and other such pressing military matters).

HyTime is an extension of SGML, providing a set of syntactic constructs: it doesn't specify a processing system.

Further Reading

The standard reference for SGML is Charles Goldfarb's *SGML Handbook* (Oxford University Press, 1990). This is a comprehensive and authoritative guide to the ISO standard — but no one could accuse it of being an easy read.

Most readers will want to start with Eric van Herwijnen's *Practical SGML* (Kluwer Academic Publishers, 1990). This gives a superb overview of the 'hows' of SGML as well as the 'whats', and covers SGML's relationship with CALS, EDIFACT, databases and so on. Cannot be recommended too highly.

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Sanyo 18NB

Six months with Sanyo's 18NB notebook has been uneventful, says Steve Godwin. The lack of ports is a pain, but Superstore's transparent compression helped out.

Back in July, I needed a notebook PC to do some work on the move. I looked around for a machine in the £2000 price range, with a 386 processor to run Windows 3.0 in Enhanced mode and the largest hard disk I could find. At the time, most notebooks only had 20 or 40Mb hard drives, but Sanyo had some 60Mb drives.

I was told that the larger drives would be available on more machines in August, but I couldn't wait that long so I ordered a Sanyo 18NB with 5Mb of RAM and a 60Mb hard disk from Time Computers. The machine arrived, and on inspection I found that about 10 pixels on the screen were faulty. I sent the machine back and received a replacement in a few days. There are two pixels missing on the new screen, but they are in inconspicuous places and have never bothered me.

Mouse swap

The machine was supplied with Microsoft's DOS 4.01 but I have never been a fan of this version and installed version 5.0 along with Windows 3.0. I purchased a Logitech Mouseman but there seemed to be a compatibility problem whereby if I dragged the cursor from the top of the screen to the bottom, it would stop momentarily at a few points during its journey. After trying several mouse drivers, I found that the only way to solve the problem was to swap the mouse with the older Logitech model on my desktop machine.

I then installed Word for Windows and Borland C++ along with the other tools and editors I use in my work, plus some games to keep me occupied on long train journeys. When I purchased the machine, I had not expected to be able to use software containing animation (notably games) because of the persistence (where an image takes a

while to disappear) I had seen on other LCD screens. But I was pleasantly surprised by the quality of the Sanyo screen and have since seen other, more expensive and newer notebooks with far worse displays.

To start with the 60Mb disk was ample, but I got to the stage when even after disciplining myself to remove unwanted files, I still had only about 10Mb free which I wanted to keep free for windows to use as swap space. I then used PKware's PKlite, a shareware program that compresses executable files (.EXE and .COM) on the disk and then decompresses them on the fly when the program loads. This saved just over 2Mb, but still left me with less free space than I ideally wanted.

Just about this time Digital Research released DRDOS 6, its answer to Microsoft's MSDOS 5. The new DRDOS comes with a program called Superstore that creates a large file on the hard disk which it uses to store files in its own compressed format. The compression is transparent to the user as it is done when the data is read and written to the disk. Even after using PKlite on all the executable files (which cannot now be compressed) Superstore increased the usable disk space from 62Mb to 122Mb, an increase of almost 100%. I now have plenty of room for expansion.

(As an aside, Superstore is available as a standalone product but it works out cheaper to buy DRDOS 6, although the version of Superstore bundled with it has had some features removed, such as the ability to compress floppy disks.)

Power is provided by a multivoltage power supply unit or a built-in NiCad battery. The former is a bit on the big side, but it does recharge the battery in one hour, which comes in handy when trips are punctuated by short stops.

The 18NB is lacking in ports. There



is only one serial port, so, for example, a mouse and external modem can't be used simultaneously, although an internal modem is on the list of Sanyo's peripherals. Neither is there an external keyboard port, but I am more than happy with the one that is built in and have not yet felt the need for a full-size keyboard.

Having said this, however, extensive use of the numeric pad can be a pain. One layout feature of the Sanyo keyboard that seems to be rare on notebooks is that the slash '/' key is in the bottom left-hand corner as in full-size UK keyboards. This is no great shakes but makes swapping between notebook and desktop machines less painful. There are no ports for a base station or external floppy either, so if you want to use any expansion cards you will have to let your desktop machine do this — or consider another notebook.

Compliment

Life with the Sanyo has generally been uneventful. I mean this as a compliment, as it has just run all the software I have thrown at it and has been a pleasure to use. I carry it around in a soft satchel, and with all the knocks and bumps it has sustained, there have been no faults (he says, tapping the underside of the desk gently) and it still looks presentable whereas other notebooks I have encountered look decidedly shabby after a few months 'good' use.

With lower prices and a new, larger 85Mb drive now available, the Sanyo 18NB would still be high on my list if I were looking for a replacement.

Sanyo is on (0923) 57363.

PC File V

ButtonWare's PC File V is a user-friendly flatfile database with some facilities normally found in a full relational system. It reminded Tony Saunder-Davies of his early days.

The first PC database program I used was dBase II, and I was dismayed on finding how difficult it was to do something so fundamental (to me) as print a number of address labels, or prepare a simple file for mailmerge. Then someone gave me an early copy of PC File: I don't know exactly which version it was, but I can remember the relief I felt when I started to use it. Here was a program which was written with the end-user in mind, and a not-very-technical-end-user at that. Help screens at the touch of a key! Even a 'Teach mode'! There was query by example (you type what you are looking for into a blank field on the entry screen) instead of the tedious 'list for SURNAME="Smith" and TOWN="Richmond"' at that notorious dot prompt.

Since then PC File has gone through many revisions; the latest is PC File V. The previous one, PC File + 3.0, is officially no longer available but many bulletin boards and shareware vendors still offer it, and each version has retained an innate 'user friendly' feel about it. Like some of the best (but not necessarily the most powerful) programs, a user quickly gets to the stage where operations become instinctive: one simply gets on with the job.

Full relational facilities

ButtonWare, the manufacturer, once claimed PC File to be a full relational database; the company now calls it — correctly — a 'flatfile' database. But it does offer some of the facilities of a full relational database: you could, for example, link a customer and supplier file, either in fields in the file itself, or in reports or letters.

All versions of PC File do the usual things: you can design entry screens, fields can contain up to 254 characters, number, Boolean and date fields can be used. Calculations can be performed on number fields, so fields like 'VAT: TOTAL*.175' are possible. In PC File V you can also set up 'memo' fields which can be up to 5000 characters long — and they can be searched.

Reporting is comprehensive with good formatting controls, and can be fully selective using various search conditions, either by the 'simple' system of

Query By Example, or a 'complex' method linking two or more conditions. Outside of reporting, once a record is found another of those helpful menus pops up, describing what operations can be performed on it. PC File lacks a built-in programming language but conditional statements can be used, giving more than enough power for the average small user. There is also a powerful macro capability.

Graphics are supported, as well as a rather more useful letter writer. Wordwrap and variable margins are available, and in typical PC File fashion, both the fieldnames of the current

files, in my opinion the most useful form of instruction.

PC File V has some new features. Both database and index files are dBase compatible, which gives the program an extra dimension with the ability to switch between one ordering of a file and another very quickly. You can either sort a file, or set up one or more index files. Also, more than one entry screen can be used, removing a substantial limitation on earlier versions.

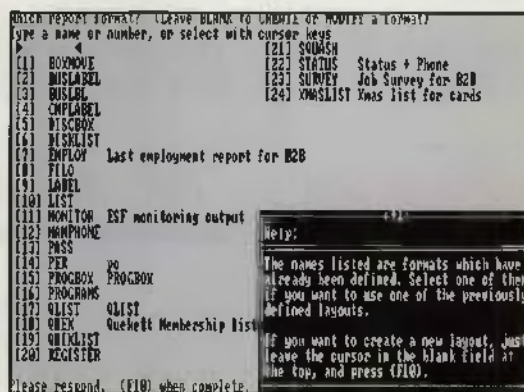
Import problems

It is not all sweetness and light with PC File V, though. I had some problems with files imported from previous versions, when 'Find' operations would fail for no apparent reason. Eventually I discovered that in these cases the 'Find Case Sensitive' entry in the Profile file for the file had to be switched off. Fields longer than 65 characters become 'window' fields; to see the extra characters you must pan left and right along the line, a feature that PC File + 3.0 avoided.

Version 5 boasts a potentially useful 'dial off the screen' facility, but I have been unable to get it to work. If the Case Sensitive find is switched on it reports 'No telephone number' even though the number is staring it in the face on screen. With the Case Sensitive find off when it does find it, the Hayes-compatible modem in my 386/33 clone fails to dial out properly. It may be that the tone dialling needs slowing down — the investigation continues. And no doubt the PCW office will shortly be knee high in letters from people who have no problems on this account...

For many years I've been persuading small-business users that they don't need to spend a fortune on software. I've kitted them out with Galaxy (now Galaxy Lite) as word processor, the AseasyAs spreadsheet, and of course, PC File. I've had no complaints.

PC File V is available as a download from many bulletin boards, including CIX, or from most shareware distributors. Registration is \$89. If you don't have a hard disk it is worth trying to find a copy of PC File + 3.0 which will run on a twin floppy or single high-density floppy machine.



file, and ways of using them, are shown on screen.

A weakness of the program, however, is the lack of built-in print enhancements. It's a shame that in a program so user friendly you will have to type in something like (reaching for my printer manual) 'A 027 038 100 048 068' before the word to be underlined, and something equally longwinded to disable it afterwards. Non-techie users won't like this. Neither do I. Simple labels are easily dealt with via the Report menu; many across are best handled by a comprehensive supplementary labelling program.

There are some nice touches in PC File V. Some are available in other programs, but in many cases ButtonWare was ahead of the pack. Ever needed an entry as, say, 'The Star Hotel' but wanted it sorted under the 'S's? PC File has a 'flip' character, the ~ (tilde). You enter it as 'Star Hotel~The' and it sorts correctly, but in a report or letter it prints as the desired 'The Star Hotel'. Neat! The help screens are intelligently designed and contain exam-

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OS too little, too late?

Guy Swarbrick's pseudonymous mole Sharon gives a glimpse of long-awaited OS/2 2. It's not what IBM cracks it up to be but neither is it a dud. Could it yet challenge (as well as run) Windows? Also, Guy announces the Great PCW Computers in Education Debate.

Despite all the hype surrounding OS/2 v2.0, IBM's answer to Windows' domination of the VGA monitor, it appears to be a long way from delivery. I wouldn't be able to tell you anything about it (other than what IBM has already told you) if I'd seen it personally, because I might be breaking a non-disclosure agreement. If, of course, I'd signed such a document.

Anyway, IBM can do nothing about my passing on information gained from sources other than direct experience. Of course, that means someone else may have broken an NDA, but that's not my problem.

Lowest form of life

So, what's OS/2 Version 2.0 like? It has been in beta (sorry, people have been taking part in the IBM Early Experience Program) for some time now, but the early versions lacked many of the features that IBM said made the product so good. Most notably, despite promising Better Windows than Windows, the first versions would only run Windows in Real mode. Since the lowest form of life under Windows 3.1 is Standard mode, that would have caused a lot of people a lot of problems. For that (and other reasons, like the fact that the Windows emulation was a little flaky, to say the least), the shipment date was delayed.

It had been rumoured that the product would ship in this version, with the Windows emulation tacked on later. IBM seems to have decided quite sensibly that another hobbled operating system was not going to be a success.

Hobbled operating system? Well, yes. The great thing about OS/2, first time around, was that while it offered you superb new features like real multi-tasking and a sensible file-handling system, it would also run all your old



DOS applications, making the transition from the old to the new as painless as possible. In theory.

Problem was, it never did. Oh, it ran some DOS applications, and as the version numbers wore on it got much better at it. But it never ran *all* the programs people threw at it. And by the time it was getting halfway to doing so, Windows 3.0 came along. IBM knows an awful lot about how DOS works, but Microsoft apparently knew an awful lot more. Windows 3.0 really did look as though it would be the stepping stone people had wanted.

It ran DOS apps. All of them (well, as near as makes no practical difference). The idea was that you could cling to the past, and when you did decide to go to OS/2, you could just upgrade your Windows application to the identical looking but superior OS/2 app. Or you could wait for OS/2 3, which would run your Windows apps direct, allowing you to make the same pain-free upgrade you made from DOS to Windows.

Of course, things didn't quite happen like that. The split between IBM and Microsoft is well publicised, but if you have been off-planet for the last couple of months you should know that Microsoft has effectively aban-

doned OS/2 (more accurately, it has dropped the Presentation Manager API from OS/2 3 and renamed it Windows/NT) and IBM has announced, but not delivered, a version of OS/2 that will run Windows 3.0 applications.

Theoretically, that means you now have a choice for your future operating system. But do you want one? And, perhaps more pertinently, have you really got a choice at all?

The simple answers are no and no. Yes, it is nice to have a choice of word processors, say, because different users require different features. But operating systems are a little different. DOS has been successful because people could go into a shop, buy an application, and expect it to run. Hardware standardisation has helped, but the fact is that if an operating system will do the job, more or less, that's more than most people care about.

Crumbling façade

DOS won't do the job, any longer. Windows/NT or OS/2 2 might (Windows 3.x might, for a lot of people, but I suspect that pretty façade is already starting to part from the dodgy foundations in rather too many places). But what people want is one solution. If OS/2 2 will really run Windows 3.x applications, *all* Windows 3.x applications, it might provide that single solution. Past achievements suggest that, without Microsoft's help, that isn't going to happen (to be fair, Windows 3.1 just barely supports some Windows 3.0 applications in its latest beta form).

An operating system that could run Presentation Manager and Windows applications would have been a solution for everyone. Now, in the short term at least, those who have invested small (and not so small) fortunes in either OS/2 PM or Windows applica-

tions development have no choice.

Enough of the politics. Let's imagine that you are Sharon, say, someone who chose the OS/2 route and is now part of the Early Experience Program. Let's assume that I now know most of what you know about OS/2 2 in its present state. What's it like? We don't want to give too much away because as soon as IBM gives the go-ahead, we'll print a full review. But here's a taster.

The installation is slick, on a PS/2 box at least. It won't always run on a standard DOS box. If you go the whole hog and install the High Performance File System, you have to reformat the hard disk, but that's no hardship. Everything from then on is simple Q and A.

Bootup is a long process (let's hope OS/2 is stable enough for frequent resets to be a thing of the past) and the desktop looks clunky and old fashioned when it eventually appears. That's largely down to lack of inspiration in the IBM art room, I suspect, because the icon design more than anything else makes everything look dated.

The new desktop has everything, in jargon terms. It's object oriented, it's intuitive. IBM says so. People who have used it (real people, not IBM staffers) say it's vaguely object oriented, it's unattractive, and it's slow.

Slow? Isn't that supposed to be a DOS feature? And don't people criticise DOS and Windows for grabbing disk space? Well, you're looking at 15-30Mb, depending on configuration, with OS/2 2.

The acid test, though, is: does it run Windows applications? Real, badly behaved Windows 3.0 applications? The ones people really use? The answer, perhaps surprisingly, is yes. Some of them. Sort of.

I don't think that's going to be enough.

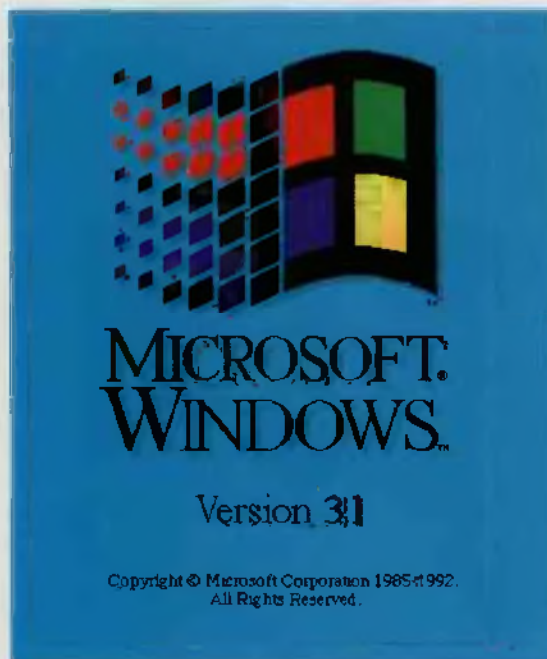
Black OLE

The most worrying thing, from IBM's point of view, is that Sharon couldn't get the OLE parts of Word for Windows 2, or any of the utility applications that come with Windows 3.1, to work in the Windows box in OS/2 2. Windows 3.1 is going to be big, and a kludge that allows software for an obsolete version of Windows will not be a great help.

DOS applications, allegedly, fair slightly better. Better than they did under OS/2 1.x, that is. But not as well as under Windows 3.0, never mind 3.1. And the neat little tricks in 3.1, like the Windows mouse cursor working in windowed DOS applications, don't happen under OS/2.

Better DOS than DOS? Better than 4.01, maybe, but better than 5? Not in any meaningful way. Better Windows than Windows? For a given machine, an application will run quicker under OS/2 than under Windows 3.0. Unfortunately for IBM, under Windows 3.1 it will be quicker still and is far more likely to work.

Even more unfortunate is that even the release version of OS/2 2.0 won't support OLE until the end of 1992 and



there is no sign of DDE links between OS/2 and Windows applications.

The future will without doubt be based around true 32-bit multi-tasking, device-independent operating systems. It is also exactly that. The future.

Computers in education

In PCW's letters page, and in the PCW conference on CIX, there has been a lot of discussion recently about the use of computers in education. The only consensus that emerged is that there is no real consensus among educators or laymen about exactly what we should be using computers for in schools, what we should be teaching children about computers (or indeed, whether we should be teaching children about computers) and which computers we should be using to do it.

The depth of feeling, from all sides, has been so great that PCW is planning a great educational debate. Over a period of months, we will present a series of articles from proponents of all forms of computer education — mind liberation, vocational training, computer assisted learning and computing for its own sake.

The debate will include contribu-

tions from eminent authorities in the fields, but we'd like to know what you think. We'd like contributions in two forms.

Contributions to the debate itself should be in the form of a 3000-4000 word article, outlining your views on computers in education and the reasoning behind them. We are as much interested in what you think is wrong with the current educational system, as with the way you think things should be done. Any such articles will be considered for publication under our normal terms and conditions.

The second category is for short, sharp expressions of opinion, the best of which will be compiled to give a flavour of public opinion towards the end of the debate.

Just to stir things up a little in the 'computers for their own sake' category, I'll pass on a few thoughts that came to me after reading a GCSE Computer Studies workbook. I won't mention the publisher or the author, because my comments are directed more at the syllabus than the workbook itself.

Overall, I'm impressed with the state of the syllabus. The emphasis has shifted somewhat from programming, which at this level is not a bad thing. But there are some serious problems.

Applications from word processing to database management, and from DTP to CAD, are covered far too lightly. Just seven of more than 300 pages in the workbook cover all applications software. There follows a far longer section on bespoke software entitled 'Applications'. Not wrong, but confusing.

It also gives you a clue as to the base content of the whole syllabus: it is mainframe and DP-oriented. Yes, I know the term DP (Data Processing) has largely been replaced with the all-encompassing IS (Information Science), but as I said, this is a DP syllabus.

What the old GCE syllabus needed was a ground-up rewrite. What it appears to have received is a token dusting off and a few minor additions.

The latest on Windows 3.1

Apparently, things are still going pretty well. The most exciting new feature is the Windows mouse pointer working with windowed DOS apps. The most interesting snippet I've come across is that using Word for Windows 2 under the latest, and allegedly final, beta release of Windows 3.1, Adobe Type Manager fonts work fine but Microsoft's own True Type fonts cause all sorts of problems. It's a funny old game...

Haval



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Novell Network Power Tools

Author: Mike Edelhart
 Publisher: Bantam Books
 Price: £46.99
 ISBN: 0-553-35224-5



There is a nightmare that stalks the land. It has already claimed many innocent people, will doubtless ensnare even more, and it comes in a set of red boxes. Novell in itself is a fine product, and both popular and reliable. It is, however, fearsomely complex and many a competent person has panicked on being told 'You're in charge of the network'. Since many companies cannot afford a full-time system manager this task often falls to someone with little or no experience of looking after any sort of network, and the shelf of manuals Novell provides are daunting indeed.

This book aims to distill the most important facts about running a Novell network, and present them in an easily accessible form. As such, the title is slightly misleading: there is a set of utilities included on a floppy disk, but they're fairly basic and would more honestly read 'How Not To Panic When Running A Network You Don't Really Understand'.

The author of the book, Mike Edelhart, is the publisher of the American magazine, *PC/Computing*. He put the tome together with the help of the Technical Editor of that journal, and as a result the book can read like a set of linked magazine articles. As such, a lot of topics are discussed in a fairly dense format, and it's not really a book for

browsers trying to get a good background in the topic over a few leisurely lunchtimes. Fortunately, there is a comprehensive and carefully compiled index; it excels when used for reference, or as a how-to book.

The first part of the book is particularly good for this. It introduces the basic concepts of networking and the technical terms found in Novell installations, and then leads on to planning every aspect of your installation. Only then does it get down to the nitty-gritty of configuring workstations and setting up the server, having taken in along the way the important aspects of managing users and designing the installation for the way they work. It asks all the right questions for this, but doesn't always help with the answers, in the traditional way of management aids.

Once past that, the next section of the book is the collection of hints, tips and troubleshooting help that most people will refer to most of the time. This is the area where most information is lumped together; little effort is made to categorise the 30-odd pages of problems and answers, so you have to rely on the index. Some sort of flow-chart would be useful here, for the subset of problems that can be diagnosed in this way. Also, I was disappointed to find very little on the methodology of fault-finding when the cabling goes wrong — in my experience, one of the most common recurring problems with networks.

The final bit of the book describes the many utilities supplied on the disk held in a tamper-proof envelope in the inside back cover. Around thirty files are provided, ranging from full-blown shareware utilities to little batch files. Some of these are for use with specific network programs, such as cc:Mail, and some are really just DOS utilities that happen to be useful for NetWare. I don't think that the established network manager will find many of them terribly useful; on the other hand, the neophyte may well appreciate having so many ready-made solutions to hand.

For its target market, this book could be a lifeline. A more apposite choice of title may have helped net such people, but you'll lose no office credibility if you're seen browsing through the book with the current name. If you've found yourself at a loose end with Novell, take a look.

Rupert Goodwins

Object-Oriented Programming: an Introduction

Author: Greg Voss
 Publisher: McGraw-Hill
 Price: £19.95
 ISBN: 0-07-881682-3

Pierre the waiter doesn't mind at all being treated like an object. Neither does his colleague Helga, nor Arnold the cook. It suits them, because they are the opening stars of this discussion of object-oriented programming.

Greg Voss simulates their restaurant to illustrate the rudiments of o-o structure. He creates a class *waiter* of which objects Pierre and Helga are instances, encapsulating private data (name, tables served, orders) and public methods (such as *PassOrder*) which involve messages. Arnold, a *Cook* object, has both private methods (recipes) and public ones such as *TakeOrder*. A *Table* object may itself contain *Customer* objects. And so on. Very simple and very clear.

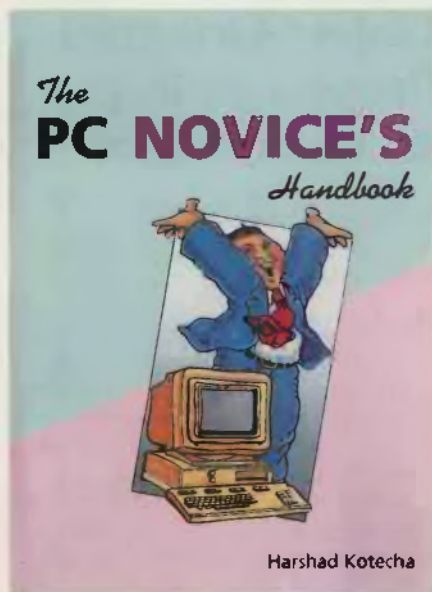
Voss soon gets down to the nitty-gritty, using window and shape classes to illustrate the trickier concepts of inheritance and polymorphism. A discussion of Smalltalk and C++, class libraries, and different implementations of an abstract *Screen* class (one under Windows 3.0) complete the first section of the book.

The second section discusses various object-based and object-oriented languages, including Pascal implementations, Borland and Zortech C++, Actor and Smalltalk. It also goes deeper into programming techniques. The concluding section covers the use of application frameworks, with discussion of C++ Views, TurboVision, and Object Windows.

I took on this review taking at face value Voss's claim that his book is suitable for anyone familiar with a procedural language such as C or Pascal. But most examples are in C++ (Voss worked for Borland during the development of Turbo C++) and an appendix on C++ syntax would have been welcome: I was soon scurrying for other reference books.

For this reason this book falls short of being a language-independent o-o primer, as suggested by the title and preface. Nevertheless it deserves attention as a companion to a primer, both for Voss's excellent exposition of principles and techniques, and as a review of available implementations and tools.

Clive Akass



The PC Novice's Handbook

Author: Harshad Kotecha
Publisher: Computer Step
Price: £8.95
ISBN: 1-874-02900-8

The PC Novice's Handbook is lacking in many ways. Kotecha races through the first chapter, 'The PC unravelled', randomly explaining some terms and ignoring others. Here he oversimplifies, there he avoids. He mentions DOS and OS/2 but doesn't make clear what they are, and no further explanation is offered until chapter 4. But the strangest omission in a book that purports to teach beginners to be 'computer literate' is the lack of a glossary of terms.

The section on software, however, is just right, with a brief description of different packages and an indication of what each can do. In a chapter entitled 'Let's go shopping', the author gives advice on buying, tips on handling dealers, and tells you how and where to find more information. It's mainly commonsense, and could be helpful to those not sure where to start and without the benefit of hard advice.

The chapter on DOS is also valuable for real beginners — it's a lot less daunting than a manual and a fairly good introduction to the subject. There is an additional section on Windows and its ben-

efits. The penultimate chapter offers information about communications, and the last chapter tells you that you are now computer literate.

Finally, appendices list recommended hardware and software companies and products, mail order companies, good magazines (*PCW* included, of course), major exhibitions, and user groups.

This book is not ideal as a complete tutorial because it tends to *mention* rather than *explain*, often assuming the reader knows what they may not, but it has its good points and some amusing illustrations ('a mouse on a mouse mat'). My favourite piece of advice is in the section on exhibitions: 'On entering a computer show, you may get a bit startled by the flashing lights and large, colourful screens everywhere.' Quite.

Catherine Eade

Video Kids

Author: Eugene F Provenzo, Jr
Publisher: Harvard MIT
Price: £17.95 hardback, £9.95 paperback
ISBN: 0-674-93709-0

Parents worry about kids playing video games. Fundamentally, this is nothing new. Parents used to worry about kids watching too much TV, and before that, parents worried about kids listening to too much rock music, and playing too much pool or snooker. The bottom line is: parents worry. In the case of Nintendo, the US Congress has worried too: at one stage an anti-trust suit was proposed.

Is worrying about video games, specifically Nintendo, reasonable? Does hanging around video arcades create

video addicts, juvenile delinquency, and teach kids that violence is acceptable? Provenzo's research shows that few adults couple their worries with actual investigation: most are unaware of the content of the games their children play.

Videogames, Provenzo argues, aren't like other toys. They are absorbing and exciting, but ultimately they impose limitations: children cannot bring their own inventiveness and creativity to bear on the games. Instead they must win or lose according to limitations imposed by someone else. Of particular concern to Provenzo, so much so that he dedicates an entire chapter to the question, is the way women appear in the games: in six of the top ten Nintendo games he reviews, women are victims who must be rescued by the male characters. Provenzo believes that this portrayal is insidious, seeping into the consciousness of the predominantly male players of the games and at the same time keeping computer culture male-dominated.

Provenzo liberally strews his short but extensively researched and annotated book with quotations from psychologists and sociologists like Bruno Bettelheim and Marshall McLuhan. Surprisingly, however, he doesn't relate the games' scenarios to fantasy literature as a whole. Fairy tales, mediaeval romances and contemporary science fiction are all based on many of the patterns of the Nintendo games, and yet he generally ignores these origins. It's difficult to take seriously an analysis of the effects on contemporary culture of these videogames without that historical context. At the same time, he refuses to see the games for what they are: puzzles to be solved.

Wendy M Grossman

December's Top Ten Books

Author	Title	Publisher	Price	This	Last
Petzold C	Programming Windows 3	Microsoft	£27.95	1	1
Woram J	PC Configuration Handbook	Bantam	£24.99	2	9
Cobb D	Running Microsoft Excel	Microsoft	£24.95	3	—
Fingerman D	Ami Pro 2 Made Easy	Osborne	£15.95	4	6
Livingstone B	Windows 3 Secrets	McGraw-Hill	£36.95	5	2
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Conan the Cimmerian

Computer: PC
Supplier: Virgin
Price: £34.95



'Know, O prince, that between the years when the oceans drank

Atlantis and the gleaming cities, and the years of the rise of the sons of Aryas, there was an Age undreamed of, when shining kingdoms lay spread across the world like blue mantles beneath the stars.

'Hither came Conan, the Cimmerian; black-haired, sullen-eyed, sword in hand, a mighty warrior destined to tread the jewelled thrones of Hyborea beneath his booted feet.

'But, before he was a world conqueror, Conan lived in Irskuld, a village of Cimmeria, where he worked as a blacksmith...'

'Sword and Sorcery' was first introduced to the world in 1925, when Robert E Howard had his first story, 'Spear and Fang', published in *Weird Tales* magazine. Conan didn't star in this first tale, but seven years later, the first Conan the Barbarian story appeared in the same magazine. Howard was born in Peaster, Texas, in 1906, but tragically he committed suicide in 1936, barely 30 years old. During his short life he produced 21 Conan stories, several of which have been adapted for the big screen, the most famous starring Arnold Schwarzenegger and Brigitte Neilson. Now those stories have been adapted to a computer game, which joins the rapidly expanding arena of graphical

'Sword and Sorcery' adventures.

The scene is set — Conan is a humble blacksmith with enormous strength from years of working at the forge. He has a self-made sword, but he is no swordsman. He has taken a wife and settled down, to what would now be referred to as a basic 9 to 5 existence. Alas, it is not to last (and a good thing too — 'Conan gets an ear-bashing after a night down the pub with his mates' probably wouldn't make such a good read) for the village of Irskuld is to fall under the wrath of Thoth Amon, High Priest of the snake god, Set, leader of a legendary band of raiders and a generally mean dude. Thoth Amon and his band of not-too-merry men wreak havoc in Conan's village, killing everything in sight, but miraculously Conan is only knocked unconscious and lives to fight another day.

Now his heart knows only the need for vengeance. So Conan the Cimmerian turns south, leaving the gutted village and his dead wife behind, to seek out and destroy the evil high priest. He begins his search in the sprawling metropolis that is Shadizar, in central Zamora. Shadizar is swarming with villainy and Conan has to be careful not to upset anybody, at least until he has picked up a few pointers on how to use his sword properly. He has very little money, so has to resort to theft in order to support himself and buy the essential supplies he will need to overcome his enemies. This seems surprisingly easy, as nobody seems to notice him walking in

and out of people's houses, which is strange because he's a seven-foot monster with virtually no clothes and a big sword. Occasionally he is caught by a town guard, thrown in jail for three months and relieved of all his money, but this is rare, and the more successful thefts he pulls off, the better he gets at it.

When he has gathered enough money (in the local tongue this is called bezants), he pays a visit to Master Quan Yo, Master-at-Arms, where he gains superior fighting skills. Only when he



has visited the Master several times should he embark on the real mission, which will take him into the Shadizar Underground, numerous underground tunnels connecting the town. These catacombs are feared by the locals for they contain various 'orrible beasts, but Conan must scour them to find all sorts of weird and wonderful things.

At various points in the game, Conan will annoy someone and have to kill them or be killed. Depending on the enemy, this may be a piece o' cake or may result in Conan's death. Thieves seem to be the easiest of opponents, as they are all about five foot tall with bad backs and small daggers. Town guards are more tricky, for two reasons — they are generally bigger, with big spears, and they always travel in pairs.

The entire game can be controlled with a mouse, and while this is recommended you can also use the keyboard or a joystick. The game is generally good fun, but several annoying bugs spoil the amusement, the most frequent being when Conan has lost a battle and his dead body falls out of the screen; the game should end at this point, but instead the opponent stands in the middle of the screen and fights the air so you have to quit the game. Also, Conan can often find himself walk-



ing into a small space and unable to walk out, so again, you have to quit and re-start. Finally, the music from my Adlib card was terrible, and if that's not bad enough, it doesn't stop when you quit the game so you have to either find another sound to send to the card or turn the PC off.

If the writers could sort out the problems, and improve the user interface slightly, then this reasonable game would be a good game. It will never be a great game.

Mat Beard

Martian Memorandum

Computer: PC
Supplier: US Gold/Access
Price: £40.95

Tex Murphy is a classic example of an American PI, a cross between Columbo and Magnum except that Tex lives in the year 2039 and doesn't drive a clapped-out Chevrolet or a Ferrari. He is rugged, handsome and good at just about everything; he's also got a big gun and wears an overcoat.



Life has been a bit quiet for Tex recently. He hasn't had a decent case since Mean Streets (the first Tex Murphy adventure), and has been scraping a living doing divorce cases and finding missing persons. It seemed like it was going to be another boring day at the office, reading through old case files and taking pictures of the girl across the street (that's the only clue you're going to get) when a message came through on his Comlink.

The Comlink is used to obtain information about people and things that Tex comes across. It is a video-link with Stacy, his faithful secretary who has access to a wealth of information that she can beam to him wherever he may be. On this occasion Stacy has news of a new case: it's another missing person, but this one's a bit special. The daughter of Marshall Alexander, head of Terraform Corporation and the richest man in the world, galaxy... whatever,

has gone missing and Alexander suspects foul play.

Terraform does 'terraforming', which is a 50-year plan to make Mars habitable. It's dangerous work: temperatures over 100°C have to be deflected by huge solar shields and lethal gases have to be transmuted into breathable ones. The Terraform head office is in San Francisco Bay, and Marshall Alexander's room is on the top floor. The building isn't difficult to find, it's the biggest on the planet and has more security personnel than the entire San Francisco Police Department. Once past the big

meathead guard, Tex is escorted to the turbo-elevator and whisked up to the top floor where he is greeted by Rhonda, Alexander's attractive secretary. He is shown into Alexander's office, who explains the situation and gives him a couple of leads to follow.

On the way out of Terraform, Tex manages to persuade Rhonda to have dinner with him at the Plaza Hotel (for two reasons; one, because he wants to ask her some questions, and two, because she is very attractive). In the few hours before his dinner-date, Tex follows up on his few leads and starts to

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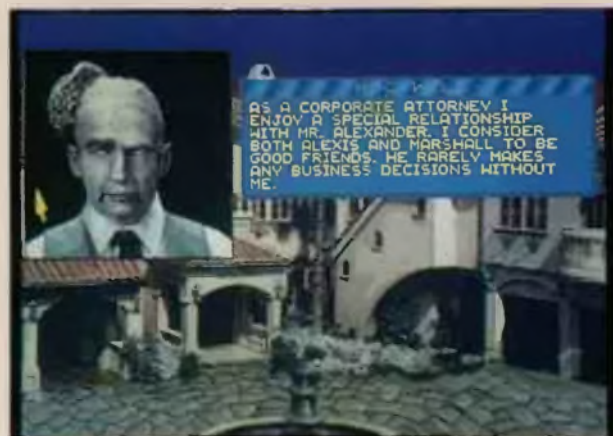
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piece together the events of the previous few weeks. Later that evening, things go well for Tex, very well, and he

followed, and puzzles solved on the way that eventually lead to Tex finding Alexis Alexander at the... no, that would spoil the plot.



ends up having a desert that isn't on the menu, if you see what I mean.

Tex's investigation takes him all over the galaxy and gets him involved with some very shady characters, the most shady of which is Big Dick Castro who runs a casino on Mars, but there's a long way to go before he gets there. A trail of murder and deceit must be followed, and puzzles solved on the way that eventually lead to Tex finding Alexis Alexander at the... no, that would spoil the plot.

The player interface is very simple and Tex can be controlled entirely by a mouse. There are several buttons at the bottom of the screen that select the particular action you want Tex to do: get, go to, look, talk etc, and he can be moved around the screen by either placing the mouse pointer where you want him to go and clicking, or by using the cursor

keys. There is a multi-layered help system in case you get stuck, which gives you a small clue the first time you consult it and will eventually solve the problem for you.

The graphics are similar to the scenery in *Blade Runner*, the Terraform building looking just like the Tyrell Corporation and Tex Murphy bearing a remarkable resemblance to Deckard, the PI/cop in the same film. The characters are all digitally animated and most of them speak. Even the speech from a PC speaker is reasonable, although some of the accents cause the sound to become distorted. The speech from my Thunderboard was better, although it still wasn't as good as some I have heard — Wing Commander II, for example. Martian Memorandum supports most major sound cards, but the music doesn't enhance the game that much and I prefer not to select it as an option.

This is a good game that doesn't require a super-fast PC (though I would recommend one), anything from an IBM PC upwards will do fine (as long as it's got a VGA or MCGA graphics card and a colour monitor). You will also need over 7Mb of disk space to accommodate the big supply of 256-colour graphics and speech, and 640K of memory. If you liked Mean Streets, you should love this.

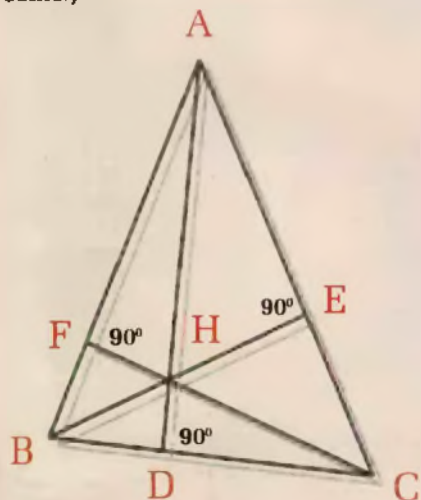
Mat Beard

LEISURE LINES

Brainteasers courtesy of JJ Clessa.

Quickie

20 nickels, or 10 dimes, or 4 quarters, make a dollar. What fraction of a dollar, a quarter, a dime and a nickel, when added together, gives a dollar? (The same fraction to be used for all four coins.)



Prize Puzzle

A nice, but perhaps more difficult than usual, puzzle submitted by one of our regular readers, Mr Stan Higgins (a previous winner on more than one occasion). Thanks Stan, for the idea. Alas, we must exclude you from the entrants.

In the diagram alongside (not to scale), AD, BE and CF are the altitudes of the acute-angled triangle ABC (that is, the perpendiculars dropped from each vertex onto the opposite side) and they meet at the orthocentre H. The twelve lengths AE, AF, BF, BD, CD, CE, AH, BH, CH, DH, EH and FH, are all different integers. What is the minimum possible area of the triangle ABC, and what the lengths of its sides?

Send the solution on a postcard or on the back of a sealed envelope (no letters, please) to: March Prize Puzzle, PCW Editorial, VNU House, 32-34 Broadwick Street, London W1A 2HG, to arrive before 31 March 1992.

Winner, December 1991

The December number crossword was a fairly straightforward problem and our winner, chosen at random from the

heap, was Mr Christopher Saunders of Wanstead, London. Congratulations Christopher, your prize will be on its way shortly. The correct solution is given below. Our condolences to all the other entrants who (like myself) never win competitions that they enter. *Nil desperandum* — it could be your turn next.

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1		1	4	2				7	9		1
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	9				6	2	4	2	0		5
9				5	2	6	4	0			6
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		3	2	0			5	6	2	5	0
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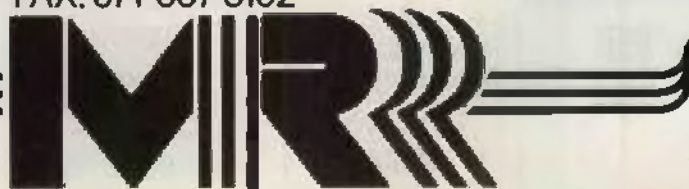
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DAY 2

TAKE A

CHANCE

DAY 3

MAKE 24
PHONE CALLS
~
LOSE
2 DAYS

DAY 4

CONFUSED BY
CONFLICTING
INFORMATION —
GO BACK
2 DAYS

DAY 5

RECEIVE
17 QUOTATIONS
~
LOSE 5 DAYS
EVALUATING

DAY 23

OUT OF SPACE
ON HARD DISK
~
MISS
A TURN

DAY 22

STAB IN

THE DARK

DAY 21

MACHINE FROM
THE FAR EAST
BREAKS DOWN —
WAIT 2 WEEKS
FOR REPAIRS

DAY 20

LAND BIG CONTRACT
BY RESPONDING
QUICKLY WITH
SILICON VALLEY
COMPUTER —
GO ON TO FINISH

DAY 19

HOPE FOR

THE BEST

DAY 18

LOSE A WEEK —
MACHINE
FROM
THE FAR EAST
IS SO SLOW

DAY 17

EXCEED
BUDGET
**GO TO
JAIL**

DAY 16

MACHINE ARRIVES
FROM THE FAR EAST,
BUT IT WON'T
WORK —
LOSE 7 DAYS

DAY 15

BUY A
SILICON VALLEY
COMPUTER —
MOVE AHEAD
5 DAYS

DAY 14

**FINGERS
CROSSED!**


DAY 13

MAKE A
DECISION
~
MOVE AHEAD
2 DAYS

DAY 12

ARRIVE AT
SILICON VALLEY
**FREE
PARKIN**

DAY 6

VISIT
6 SHOWROOMS
AND UNTOLD
DEMOS —
LOSE 4 DAYS

DAY 7

RISK

EVERYTHIN

DAY 8

SUPPLIER
GOES BUST
~
GO BACK
3 DAYS

DAY 9

ARRANGE A
DEMONSTRATION
SILICON VALLEY —
MOVE AHEAD
3 DAYS

DAY 10

HAVE /

GAMBL

DAY 11

DON'T GET
ENOUGH RAM —
LOSE A WEEK
WAITING FOR
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The stuff of computing

How do you get a quart of reality into a computational pint pot? Nick Beard considers the stuff of computing, and looks at lattice gases, programmable matter and automata.

It is late, and the results of your simulation work are needed by morning. With a whole weekend left, you thought you had lots of time, but as usual the boss changed all that. It is a big fluid dynamics problem — yuk. 'It looks good at 10^{14} particles' said the boss at lunch on Friday, 'but we'd better try it at 10^{20} . Some of these fluid systems jump around a bit up there, and we may miss it at the lower granularity.' Even this looked promising — then that irksome non-linearity showed up.

The boss was right: we needed the extra particles. You miss things by oversimplifying the system, and we would have missed the crucial twist in the system dynamics. You need extra computing power now — in fact, double the amount you first thought you needed — to explore the fractal edges of that bifurcation.

Fortunately, cash is no object on this one (yes, I know, but this bit *is* fiction) so you crack open another crate of *CompuPowder*. Add a jar of heavy water, place the vial in the magneto-stirrer, and after a few anxiety provoking moments of effervescence, it is ready. Double the amount of computer, double the computing power. Fire up the YAG laser for your I/O channels, and computation can begin again.

CompuPowder

CompuPowder is, of course, not yet available. (A small amount of it should be available for experimental purposes from 1 April. Readers should write to me c/o PCW.) What is it that computers do that is of worth? Perform computations, and more importantly, be programmed. However, when one runs out of steam, bolting two computers together does not double the power — unlike *CompuPowder*, which is a form of *programmable matter*.

Programmable matter allows the

same lump of machinery — block of computing stuff — to be a wind tunnel, or a sea of subatomic particles, a population model of disease activity or a gene pool — all at the flick of a switch (like in the opening tale, at the flick of a trigger on the activating and read/write laser). It has a number of key properties: it is highly flexible (adaptable that is, not necessarily bendy!), instantly reconfigurable, and safe to handle. Although any old computer has these properties to some extent, there are distinct limits — and ones that are not readily passed once reached. If



your PC gets stuck on a big problem, wiring it to another PC is rarely the solution. There is a similarity between PCs and *CompuPowder*, though: you see it in big networks.

Wiring together a network of PCs produces a kind of 'synthetic material' which has bulk properties that are relatively well defined, and stable in the face of changes in the precise number of PCs and wiring topology. Connect a dozen PCs, and you do not get a dozen-fold jump in PC potency: you get a different type of object. Connect together a pair of such objects (networks), however, and you produce a further more 'powerful' network with similar overall operating characteristics. With enough computers, and some of the control problems solved (easier written than done...) programmable matter begins to surface.

A form of programmable matter *does* exist: the CAM-6 (Cellular Automata Machine), built by Tommaso Toffoli and Norman Margolus of the Computing Science Labs at MIT. Toffoli and Margolus are in the Information Mechanics Group, concerned with researching reversible computing (see 'Frontiers', August 1991) and cellular automata.

Cellular automata

CAs were introduced in the 1950s, by John von Neumann and Stan Ulam, to help with the study of complex systems. A CA is a set of *identical* processors located on a *regular* lattice, with *restricted* connections to their neighbours (for software to help you explore CAs, see the Short Review of Rudy Rucker's Cellular Automata Laboratory in this issue).

The behaviour of the system arises as a consequence of *update rules* which specify the changes of state in cells as a consequence of the state of neighbouring cells. The CAM-6 embodies this approach in hardware. It is available commercially for a couple of thousand dollars and plugs into a PC. It enables real-world work to be conducted, such as in fluid dynamics. The CAM-6 can turn a PC into a system able to do things that would otherwise require Cray supercomputers. Indeed, Toffoli and Margolus write that for CA experiments above a certain size it is absurd to use any other kind of computer.

CA machines are programmable matter, representing a general paradigm for parallel computing — not limited by any inherent architectural feature. You just buy as much programmable matter as your credit limit allows. This is in sharp contrast to conventional architectures, where as the power rises, the problems of communications rise at least as quickly. In a CA machine,

'computing cell 19B' only chatter to its neighbours, and neither knows nor cares how many additional cells have just been bolted on at the edges of the machine. Cellular automata communicate only with close neighbours, not with lumps of the machine at the other corner of the box.

The CAM-6 is already being supplanted by the CAM-8, which can simulate fully parallel and synchronous updating of *billions* of 16-bit cells. The near future promises machines able to deliver CA-based simulations using hundreds of billions—even trillions—of *simultaneous* updates per second.

The cost of all this power is not especially high. One of the main 'tricks' for keeping the cost down is the architecture. This is 'resident' in controller chips, one of which is attached to each few million or so cells which are simply ordinary RAM chips. The controller holds the 'lookup table' of CA update rules (the specification of interactions between cells), so the 'space' of RAM can be reconfigured instantly by switching to another controller.

Hot air and computing molecules

This approach can provide a lot of computing power—contrast it with the use of current supercomputers. Running fine-grained 3D fluid dynamics models, machines like the Cray X-MP or the Connection Machine can provide simulations of 'events' at a rate of around 10^8 per second. With one day of computer time (around 10^5 seconds) you get to 'see' 10^{13} events, enough to grasp only the merest glimpse of the overall bulk dynamics of the system being studied. By reconfiguring the hardware to run as a CA machine, we can obtain up to *four orders of magnitude* greater performance—simulation on a truly grand scale.

Who will use such devices? There are a number of groups of researchers who might profit, such as statistical mechanics researchers and parallel hardware specialists, or scientists working in the realm of molecular dynamics. They frequently use Newtonian models of interactions between many, many bodies, which can quickly produce *large* computational problems.

An obvious application of CA machines is the study of CAs. CA research can be grouped under two problem headings: the forward problem and the inverse problem. The forward problem concerns determining (that is, predicting) the behaviour of a CA for a given set of update rules. The inverse problem concerns finding CA rules that will match a given set of properties. The

inverse problem is more important: finding descriptions to match phenomena is the essence of simulation. The two are, however, linked. Approaching this as a classically inductive lump of science, we can start by trying to understand the forward problem in the hope that principles will arise to help solve the inverse problem.

Stephen Wolfram (author of symbolic maths program Mathematica) made a detailed study of types of CAs, and attempted to group all possible CAs into four categories which now bear his name. Wolfram Class I automata evolve to a constant state and then sit still, whereas Wolfram Class II CAs evolve to isolated periodic segments (such as flashing and oscillating 'noughts and crosses' grid shapes).

Class III are highly unpredictable: they evolve to states which are always chaotic. Wolfram's Class IV automata are the rarest, though perhaps the most useful: they evolve to states which have *isolated chaotic segments*. It is not always easy to place an automata into the appropriate class; for example, whether an arbitrary automaton falls into class I is *formally undecidable*.

So the study of CAs continues to be an important use for CA machines. Another is the application of CA techniques to real problems. An example is studying 3D fluid flows in systems with high Reynolds numbers, such as systems with combinations of hydrodynamic and chemical activity (the Reynolds number is a relationship between viscosity and flow velocity that tells you something about the propensity of the fluid to turbulence).

Lattice work

Fluid dynamics is a tough topic. Here we find some of the only bits of classical physics that are not well understood. Simulation is required, but this is computationally costly. When contemplating simulation of fluid dynamical phenomena, it makes sense to construct 'molecular' models. Represent the problem as a bunch of particles, specify their interaction characteristics, and see what happens. This has proved extremely valuable over the years, but there are some serious limitations related to computational limits on the numbers of particles that can be represented. Avoiding these limits calls for massive parallelism, but properly exploiting such parallelism can add complexity costs.

An alternative approach has been developed over recent years, based on *lattice gas automata*. This approach offers program code simplicity, inherent parallelism, and the ability to be

implemented directly on CA machines, avoiding the communications difficulties that parallelism can bring.

Lattice gases are constructed (or rather, programmed) as collections of zero-dimensional particles, each constrained to move only in a one-dimensional displacement. The update sequence is fairly simple: each 'molecule' moves one link in the lattice, to the vortex closest to the direction of path promised by the particle's velocity. When two particles collide head-on, they are replaced by one travelling at right angles. This approach, while including several 'layers' of approximation, has been shown to provide acceptable solutions to the Navier-Stokes equations (canonical descriptions of fluid dynamical systems) which are generally hard to obtain.

A pain in the RS232

Lattice gas automata have a wider application, in that they appear to be a good technique for the solution of partial differential equations. These are functions for which there are few reliable guidelines for analytical solutions. Don't expect to see lattice gas bolt-ons as popular accessories for most business and domestic PCs, but these techniques are likely to surface in places other than research labs in the next few years, such as virtual reality boxes needing fast and accurate simulations, or wind tunnels. Anywhere there is a need to solve partial differential equations, as solving them by conventional means can be a real pain in the RS232.

Resource Guide

Lattice Gas Methods

Gary Doolen (ed), MIT Press
Subtitled 'Theory, Applications and Hardware', this is the proceedings of a NATO conference on lattice gases which surveyed the state of the art in using lattice gas techniques for solving a range of equation types.

Lattice Gas Methods for Partial Differential Equations

Gary Doolen (ed), Addison Wesley
A proceedings volume from the remarkable Santa Fe Institute series 'Studies in the Sciences of Complexity'. An advanced volume, covering a great deal of advanced theory: for example, it includes a paper by Wolfram on cellular automaton fluids.

Cellular Automata

Howard Gutowitz, MIT Press
A detailed survey of CA theory, underlying maths, hardware and applications. Includes an intriguing set of 'maps' of CA literature, relating it to lattice gas work.

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see also Borland

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JPI TopSpeed C++ Pro Dev. £229.00

C Compilers

see also Microsoft

Watcom C 8.5 £275.00
Watcom C386 8.5 with ADS Supp £495.00
Aztec C 86 (with ROM support) £265.00
TopSpeed C PE £175.00

C Datafile

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Pharlap 286 DOS Ext SDK (new) £325.00

Fortran Compilers

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Practical fractals

Mandelbrot's babies continue to amaze. You can already buy systems for fractal compression — the more complex the image, the better. Even more astonishing, they can 'see' real detail that isn't pictured. Tim Frost explains.

Fractals are a consuming hobby for many. Fractint, the ever-growing public domain fractal program, continues to eat up processing hours across the globe, growing ever more complex and detailed images from a simple formula.

The fractal, a name coined by the father of fractals, Benoit Mandelbrot, is a structure comprised of many similar-looking forms. To build the structure, these simple forms might be moved, rotated, reflected, skewed, enlarged or compressed. But in the end, no matter how complex, elegant, or realistic the structure or image is, it can be broken back down to a few simple equations.

It is only 15 years since Mandelbrot first brought the fractal to the world's notice with his book *The Fractal Geometry of Nature*. Since then, a small but growing group of mathematicians, both professional and amateur, has been adding to the knowledge base.

Apart from the beauty and ease of modification of fractals, there is more than a little similarity between some fractal images and natural forms. Michael Barnsley's fern fractal is one of the most evident examples. From a single, iterated, simple equation, together with transformations, a fern 'grows' on screen. Theoretically there is no limit to the amount of detail that can be shown — the more iterations, the more detail appears.

Theories

Being able to create such lifelike images leads to theories that real life is linked at some level with fractal geometry — that complex forms are constructed from just a relatively small number of simple components.

While the theories and the computer-generated pictures are nice to play with, can the fractal do anything else other than entertain? Programs like

Fractint all work one way, starting with an equation and seeing what image comes out of it. A more practical application would be the reverse, taking an existing image and find out if it can be broken down to its simple mathematical components.

Michael Barnsley, a UK mathematician based for many years at the Georgia Institute of Technology, worked on overlaying different fractal sets to create recognisable images of natural forms, including a face. This led to the Collage theory, by which any image could be recreated by overlaying a number of fractals. Since Barnsley and his team had a working knowledge of the many fractal forms around, they were able to look at an image and take an educated hit at some of its component fractals. But making a practical, imaging application from Collage theory proved a daunting task.

In one of those odd moments where inspiration strikes out of the blue, Barnsley was looking at a painting by his late father of a scene through a gridded window when he thought of the Fractal Transform process, which involves similar grids.

The advantage of fractal image description is evident to anyone who uses drawing and painting packages. Stored pixel images require a piece of data describing each and every pixel, which is a lot of data when there are 256K pixels in a full SuperVGA screen.

On the other hand, items in vector images are derived mathematically and stored simply as formulae, together with other data such as line thickness or fill. The image for the same SuperVGA resolution screen displaying several large, filled, squares can be stored in a tiny fraction of the space needed to describe every pixel. The only problem is that you are restricted to using math-

ematically derived objects. Bezier curves allow freehand drawing but cannot be applied to 'real' pictures. Not until Barnsley's inspiration in March 1988 was there any possibility of breaking real photographic images down into a similar set of easily stored mathematical equations.

Domains

Like most of these things, the idea is really quite simple. The Fractal Transform breaks the image down into a grid of small parallelograms called domains. The image is also divided into a different grid of larger blocks. These, the smaller 'domains' and the larger 'ranges' do not match directly over the pixel grid of an image, and the blocks may well overlap pixels.

The small domain block is compared to each of the larger range blocks, to see if there is any similarity between them. As long as there is a good level of 'self-similarity', regardless of how the range and domain differ in orientation, placement or size, there is an 'Affine map' that can be stored as an equation. This comparison can be colour, intensity or pattern, and the similarity can be after the domain block has been enlarged, compressed, rotated, skewed or transformed.

A domain block will often map to more than one range block, so several range blocks can be regenerated from a single domain. The level of this Affine redundancy varies with the type of image being processed. In fact, the more complex the image, the more likely there is to be self-similar areas, the greater the Affine redundancy, and less data needed to describe the image.

The result of a Fractal transform is a set of fractals, typically between 1000 and 10,000 per image, which can be stored as mathematical equations, radi-

cally reducing file size. In Barnsley's image compression applications, this file of data is further compressed using more standard compression techniques. Together, the two produce compressions that can only be described as dramatic — a 768K 24-bit Targa file image can be Fractal Transformed and stored in only 10K!

To see the file, the image is literally reconstructed from the fractal information using the stored Affine mappings. All numbers are converted to integers, which avoids the use of slower floating point processing, so this decompression can be achieved just in software on a normal PC. The amount of time taken to show the image varies with the speed of the machine and the amount of detail required.

Like vector graphics, the fractal image is completely resolution independent. You are not displaying a finite number of pixels, but building up the image from a mathematical model.

As with any fractal, increasing the number of iterations increases the detail shown. The only down side is the time taken to process the increased detail.

On a 33MHz 386, a 320x200 image takes under two seconds to image, and increasing the resolution to 640x400 increases this to around six seconds. As resolution increases, the processing time can go up exponentially. But hardware and software developments are increasing processing speed by a factor of four each year, so next year it should take two seconds to display the 640x400 image, and the year after the same time to display a 1280x800 image.

Getting down to details

A distinctly odd feature of a fractally processed image is its ability to show detail that wasn't there in the original. Let's go back to two basic points about fractals: there is no theoretical limit to the number of iterations, and increasing the number of iterations increases the detail.

Take a 640x400 pixel image (from any bitmapped file) and fractal transform it down to its component fractals. Now reverse the operation with enough iterations to rebuild a 640x400 image, but then carry on with a few more iterations. More iterations means more detail so the Fractal Transform displays more detail than there was in the original image. This is not 'real' detail but is derived mathematically from the natural patterns in the image.

But, if the real world is essentially a fractal place, and if the fractal transform identifies the component fractals very accurately, then this increased

detail will show what is really there even though the original picture quality wasn't good enough to show it. In other words, you could take a microscopic picture of a tiny object, fractal transform the image and zoom it to see what the camera couldn't.

This idea is at the earliest development stage, but there are other image details that can be derived from Fractal Transforms that may enable us to 'see' things that aren't there. In images of a natural form (from landscapes to medical imaging), the distance between a small domain block and matching self-similar range blocks will be fairly randomly distributed. But if there is an 'odd' feature that bears no direct relationship to its total surroundings (such as a camouflaged installation, or a set of cancerous cells), the self-similar range blocks will all be clustered in that particular area. So if the distancing part of the Affine maps shows an abnormal distribution, you know there is something odd in the image and you can identify where it is, even though it may not be immediately visible by just looking at the image.

Asymmetric systems

Barnsley left full-time professorship several years ago and set up Iterated Systems to develop Fractal Transform hardware and software and to continue developing fractal maths theory. Most of the dozen or so fractal mathematicians around the world have come to work for him (Mandelbrot still remains very much part of IBM).

The Fractal Transformation systems developed have proved to be asymmetric. It is a lot easier to decode and display a fractal image file than it is to encode it. The decode requirements are simply a standard PC with SuperVGA and the decoding software — no additional hardware is required. (It will work with VGA and below, but as all the images are 256 colours there isn't a lot of point.)

An inexpensive Windows decoding package called Fractal Formatter is about to be released which includes a neat graphics format display/converter and a couple of hundred(!) hi-res 256-colour clip art images, all on just three 1.2Mb floppies. The encoding side is not quite so simple. There will be three levels of encoding electronics, all built on PC plug-in cards. The top-level board (around £16k) is primarily for heavy-duty users and bureaux. The board uses an i960 processor and eight ASICs working in parallel to do the number crunching, achieving processing speeds of 5.4 mips.

The compression system takes in

Targa, Tiff or Rasta images and converts them to 640x400 fractal image format (FIF) files of typically 10K size.

The next two encoding boards will be a medium-cost package for encoding 320x200 images, and some time later this year a medium-quality 320x200 encoder, probably costing around £200.

Moving images

Compressed stills imaging is only one of the possibilities offered by Fractal Transform. There are also systems supporting moving images, which could be either for playing video back off disk or for sending images over low-bandwidth transmission systems — for instance, for colour videophone on a standard phone socket.

The frame rate that the video processor works at is dependent on the hardware speed, the amount of compression needed, and the image size required during playback. At the moment, on a 386/33 a full-colour 256x160 video image can be played back at 21 frames/second, just under the speed needed for absolutely smooth movements. But with the predicted increase in processing speed, there will be SuperVGA video at TV frame rates in just over a year.

One of the tricks of processing digital video is not to process each and every image. Rather, you send only the difference between consecutive frames. Since most of the time each frame is similar to its predecessor, this massively reduces the data volume to be handled. Typically, a highly compressed video frame will take up 1500 bytes, which is 37.5K per second. This is where things become interesting, for low-bandwidth transmissions and for putting short video inserts into presentations. Video inserts used to hammer home a point in a presentation are usually only a few seconds long, so with a Fractal Transform could easily be placed on a 'normal' hard disk.

FIF files could become common currency for anyone who wants to use computer-stored images, especially at the desktop PC level where the advantages of 10K files and the standards independence are important.

Transforms are least happy with almost 'empty' images with limited patterns to map, such as text. The more complex the image, the more the Fractal Transform likes it, so the move up to specialist applications like colour fractal phones and colour fractal faxes are both possibilities, but the move down to transforms tailored to black and white text is something that requires a little more work.

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The right angle

Mike Mudge presents a study of Right Angled Triangles, or Pythagoras Rules ABC!

The problem area this month is that of Right Angled Triangles (RATs) and the particular investigation has been suggested by Christopher John Roberts, alias CJ, of Twyford, Berkshire.

1) By inspection or otherwise define the necessary and sufficient conditions for a triangle with integer length sides to be a RAT. (Answer in the box.)

2) Construct and implement an algorithm to find the length, C, of the hypotenuse such that two RATs are possible. Give the first four values of C. (Answer in the box.)

3) Construct and implement an algorithm to find C such that four RATs are possible, giving the first four values.

4) Construct and implement an algorithm to determine how many, N(C), RATs are possible for a given value of C.

Test Data N(9125) = 10, N(32045) = 40, N(359125) = 52.

5) For the enthusiastic (all readers of Numbers Count, surely), construct and implement an algorithm to count RATs for all C-values, up to a specified C_{max} , and to list the associated A and B values in an orderly manner.

6) Due to Mike M. Extend the above concept to consider not C the hypotenuse of an integer-sided RAT, but D the body diagonal of a rectangular parallelepiped viz $D^2 = A^2 + B^2 + C^2$.

7) Due again to Mike M. What happens in n-dimensions to the regular hyper-parallelepiped? Here the algebra is the obvious generalisation, $X^2 = x_1^2 + x_2^2 + x_3^2 + \dots + x_n^2$ where of course these x_i are all positive integers.

Suggest possible ARIT, RAT-like names for above 'shapes'.

Attempts at some or all of the above problems may be sent to Mike Mudge, 22 Gors Fach, Pwll-Trap, St Clears, Carmarthen, Dyfed SA33 4AQ, tel (0994) 231121, to arrive by 1 May 1992. Any communications received will be judged, using suitable subjective criteria, and a prize will be awarded by PCW to the 'best' contribution arriving by the closing date. It would be

greatly appreciated if such submissions contained a brief description of the hardware used, program listings, run times and a summary of the results obtained; together with suggestions for further work in this area, all in a form suitable for publication in PCW.

Answer 1) C has one prime factor, P , of the form $4*n + 1$, for integer n .
Answer 2) C has a factor P^2 , so 25, 169, 289 and 841 are the required values... the problem rapidly becomes more complicated!

Review, August 1991: a simple divisibility problem using Fibonacci-type sequences

This problem area produced an outstandingly large number of replies, all of which were of a very high standard. This seems an appropriate time to thank everyone who responded on this occasion and also all those who showed support for the 'Numbers Count' column during its temporary absence in September and October. Note that the column now has a full page.

Tiger Redman programmed in BASIC on a BBC B and reached $k=6721$ in about 100 seconds; HT Lovett-Turner (and others) noted that the 'Schofield Sequence' is identical to the original Henry Lucas Sequence (he also asks if Henry Lucas and Edouard Loucas are the same person?); he took k to 4181 in 7.5 hours in Borland Turbo BASIC on an Amstrad 1640HD20. Frank Webster advanced k to 15251 in 372 minutes in BBC BASIC on an Acorn Electron. A second submission from Tiger Redman advanced k to 29281, while Andrew Simpson went up to $k = 35785$ with a 7479 digit associated Lucas Number. Reference Fibonacci and Lucas Numbers (etc), S Vajda (1989).

Mr AGW Edmunds found the first 27 Schofield Pseudo-Primes, taking k up to 100127 in the ever popular BASIC on the equally popular BBC B. A contribution from PB Rayner used UBASIC86, a public domain version of BASIC which handles numbers up to 10^{200} , on a Viglen Vig III PC with 20MHz 386DX processor and 387 co-processor together with 4Mb of memory. Paul listed the Schofield terms up to $k = 10877$ and then extended the search to the first 62 terms — that is, up to $k=497761$ with

an associated term (not printed) having over 100000 digits, the time being in excess of 16 hours.

Nigel Backhouse accompanied his study of this problem with a copy of *Mathematical Review* 49/8928 by A Peluso (New York) dealing with a most interesting-sounding paper, 'Some congruences of the Fibonacci numbers modulo prime p , by Hoggatt, VE Jr, and Bicknell, Marjorie, *Mathematical Magazine* vol 47 (1974) pp210-214. A sight of this work would be appreciated.

Reg Bond, a regular contributor from Derby, is to be congratulated on a four-pronged attack on this problem; the largest k value being 10525900321, the associated Schofield number having 2199783070 digits. However, if Paul Rayner's search is exhaustive (as I believe it to be) then unfortunately Reg has not found all the required terms, the first one missing being at $k=100065$.

Finally, mention must be made of a computer-free contribution by EKnighting of Crowthorne, Berkshire, who constructs suitable k values as Carmichael numbers with all factors of the form $5a \pm 1$, thus $1.199.271 = 1024651, 31.61.211 = 399001, 31.61.271 = 512461, 31.61.631 = 1193221, 31.151.1171 = 5481451, 31.181.331 = 1857241$ continuing up to $41.1721.35281 = 2489462641$ with over 5×10^8 digits in the associated term. EK also gave the theoretical verification of the correctness of these results.

The winner is Paul Rayner of Tonbridge, Kent. Congratulations, Paul.

Quick Calculation

Due to CJ: The End of the Diary Market?

The Editor, who could be described as careful with money, checked his desk and found an unused 1990 diary. Rather than put it in the bin he calculated when it would be valid again: that is, when all the dates and days matched. When is that? What is the answer for a 1989 or 1988 diary? Propose a simple rule for an old diary i) post 1963, ii) pre 1963.

Mike Mudge welcomes correspondence on any subject within the areas of number theory and computational mathematics. Particularly welcome are suggestions for future Numbers Count articles.



Win Printer Prizes Galore!



Reading-based Westcoast Limited, supplier of Pacific Data Products and the largest UK distributor of Hewlett-Packard kit, is offering *Personal Computer World* readers the chance to win some fantastic prizes — and all for the price of a postage stamp!

Pacific Data Products, founded in the US in 1986, is a leading supplier of printer-related products designed to produce high-quality output. The company has grown steadily over the years, and now offers arguably some of the best font packages on the market.

• The first part of our main prize is PDP's **Pacific Page XL PostScript Emulation Package**. First announced last summer, it's a high-speed add-on for complex PostScript printing. Its two components are the PE Cartridge which plugs into the Hewlett-Packard LaserJet, and an accelerator board (including 2Mb of memory) with an Intel i960 RISC processor for producing faster printed output. Designed to fit snugly into the HP LaserJet IIP, III, IIID and IIIP, the package contains 35 different fonts and is perfect for printing intense

logos, and this version also provides multi-language software support and documentation for English, French, and German.

What could be more useful for the winner of this splendid prize than a compatible printer? Westcoast has also kindly contributed a **Hewlett-Packard LaserJet III**. Designed with simplicity in mind, it offers low-cost printing on an impressive scale, and provides users with the power to incorporate text and graphics onto page layouts to a high standard.

• The second prizewinner will win the following impressive package. The **25-in-One!** font cartridge for the DeskJet offers a broad range of fonts, 90 in all,



quietly on any desk.

• If your name is not chosen for either of these splendid prizes, despair not — five runners-up will also win PDP products. Two of you will win **25-in-**

One! III font cartridges which provide over 172 bitmapped fonts and symbol sets for fast, high-quality output on the Epson R-7000 or the HP LaserJet series. We also have two **Complete Font Library** cartridges, enabling you to explore a collection of 51 scalable outline typestyles and thousands of fonts with an HP LaserJet III, IIID, or IIISi printer. And our final runner-up will win a **Pacific Page PE** (compatible with any Hewlett-Packard IIP, IID, III, IIID or IIIP printer), the PostScript emulation cartridge which gives you access to expensive typestyles, reverse text, rotation of text and images, scaling, shading and halftones.

Questions

- 1) In which US city is the headquarters of Pacific Data Products situated?
- 2) On which page in this issue of *PCW* does the following quote appear? '... a concept for the more distant future, involving hundreds of computers in a single room.'
- 3) Who said, on which page in this issue of *PCW*, 'the brand is more important than the company'?

graphics or complex documents.

In addition to the PP XL, we're also offering the **FontBank Cartridge**, a customisable font cartridge that uses Intel's Flash Memory for downloading and storing bitmapped fonts, images and scalable fonts. It can be reprogrammed to add or delete fonts or printer macros. The 1.5Mb configuration provides more storage space for fonts and

from 3.5 to 30 points for professional-looking output. It's an all-in-one solution for business, personal correspondence, spreadsheets and DTP. And to complement the 25-in-One!, Westcoast has donated the relevant printer: the **HP DeskJet 500**, a new generation inkjet with a 100-sheet paper feeder. It has 300dpi resolution for good print quality, and will sit neatly and

How to enter

What are we asking in return for a chance to walk away with one of these fine prizes? Just that you answer the three easy questions alongside, based on articles in this issue of *PCW*. Send your answers on a postcard, along with your name and address, to us at: *Personal Computer World* PDP Competition, VNU House, 32-34 Broadwick Street, London W1A 2HG, to reach us by 31 March 1992.

Employees and relations of Westcoast Ltd, Pacific Data Products, Hewlett-Packard and VNU Business Publications are not eligible to enter. The judge's decision is final. Winners' names will be announced in the May issue of PCW.

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10:00	300.00	11:00	300.00
10:15	302.00	11:15	302.00
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27:15	438.00	28:15	438.00
27:30	440.00	28:30	440.00
27:45	442.00	28:45	442.00
28:00	444.00	29:00	444.00
28:15	446.00	29:15	446.00
28:30	448.00	29:30	448.00
28:45	450.00	29:45	450.00
29:00	452.00	30:00	452.00
29:15	454.00	30:15	454.00
29:30	456.00	30:30	456.00
29:45	458.00	30:45	458.00
30:00	460.00	31:00	460.00
30:15	462.00	31:15	462.00
30:30	464.00	31:30	464.00
30:45	466.00	31:45	466.00
31:00	468.00	32:00	468.00
31:15	470.00	32:15	470.00
31:30	472.00	32:30	472.00
31:45	474.00	32:45	474.00
32:00	476.00	33:00	476.00
32:15	478.00	33:15	478.00
32:30	480.00	33:30	480.00
32:45	482.00	33:45	482.00
33:00	484.00	34:00	484.00
33:15	486.00	34:15	486.00
33:30	488.00	34:30	488.00
33:45	490.00	34:45	490.00
34:00	492.00	35:00	492.00
34:15	494.00	35:15	494.00
34:30	496.00	35:30	496.00
34:45	498.00	35:45	498.00
35:00	500.00	36:00	500.00
35:15	502.00	36:15	502.00
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38:15	526.00	39:15	526.00
38:30	528.00	39:30	528.00
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40:00	540.00	41:00	540.00
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40:45	546.00	41:45	546.00
41:00	548.00	42:00	548.00
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41:30	552.00	42:30	552.00
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42:00	556.00	43:00	556.00
42:15	558.00	43:15	558.00
42:30	560.00	43:30	560.00
42:45	562.00	43:45	562.00
43:00	564.00	44:00	564.00
43:15	566.00	44:15	566.00
43:30	568.00	44:30	568.00
43:45	570.00	44:45	570.00
44:00	572.00	45:00	572.00
44:15	574.00	45:15	574.00
44:30	576.00	45:30	576.00
44:45	578.00	45:45	578.00
45:00	580.00	46:00	580.00
45:15	582.00	46:15	582.00
45:30	584.00	46:30	584.00
45:45	586.00	46:45	586.00
46:00	588.00	47:00	588.00
46:15	590.00	47:15	590.00
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48:15	606.00	49:15	606.00
48:30	608.00	49:30	608.00
48:45	610.00	49:45	610.00
49:00	612.00	50:00	612.00
49:15	614.00	50:15	614.00
49:30	616.00	50:30	616.00
49:45	618.00	50:45	618.00
50:00	620.00	51:00	620.00
50:15	622.00	51:15	622.00
50:30	624.00	51:30	624.00
50:45	626.00	51:45	626.00
51:00	628.00	52:00	628.00
51:15	630.00	52:15	

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Do you have a PC 'compatible' which chokes more software than most? Karl Dallas is on the lookout for flakey BIOSs. And speaking of mysterious crashes, how exactly are you supposed to cope with the numerous interrupt settings on ISA bus expansion cards? For Windows users there are reviews of TakeNote, a replacement for the standard Cardfile accessory; and NoMouse, a replacement for the rodent itself.

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Now that Windows has tried to turn the PC into a Mac, we can compare the two platforms on a level playing field. The results may worry those who 'thought IBM'. Mick O'Neil also reviews SimAnt, an ant colony simulator, Ball & Stick, a molecular modeler, and ThoughtPattern, a program for disorganised people.

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Guidelines for the Hands On section — how you can contribute to PCW

Hands On is here to provide you with a forum to impart your wisdom to the rest of the readership. As always, we'll pay you for anything we use. For most of the departments we'll pay £60 per printed page. For Readers' Tips and Computer Answers we'll pay £25 per tip, with a bonus of a subscription to the magazine for the Tip of the Month. Contributors should supply an invoice for the relevant amount.

What are we looking for? For the applications section — Databases, Word Processing and Spreadsheets — we're looking for macros, sections of query language or useful tips and shortcuts. Low Level is for all real programming, whether it's in assembler or Pascal, C++ or Modula 2. We're not looking for 15 pages of listing. What we are looking for are concise implementations of innovative algorithms. Quiche eaters only need apply.

The four 'platform' departments — Macintosh, Windows & OS/2, Unix and Networks — are slightly different. User tips, programming tips and news of hot new products are all welcome.

Finally, Readers' Tips and Computer Answers. The first of these is fairly obvious: if you've found a better way of doing something, share your knowledge with the rest of us. With Computer Answers we'll try to answer your questions, but if you have a better answer, or we can't help someone, feel free to chip in.

All submissions, addressed to the right department, should be sent to 'Hands On' at the following address: *Personal Computer World* Editorial, VNU House, 32-34 Broadwick Street, London W1A 2HG.



Alias, a doddle

System 7 may seem more complex than its reputation led you to expect, but that's because it simplifies very complex operations. Mick O'Neil opens the Mac's System Folder to show how easy it really is. You can, for instance, get instant access to files by giving them 'nicknames'.

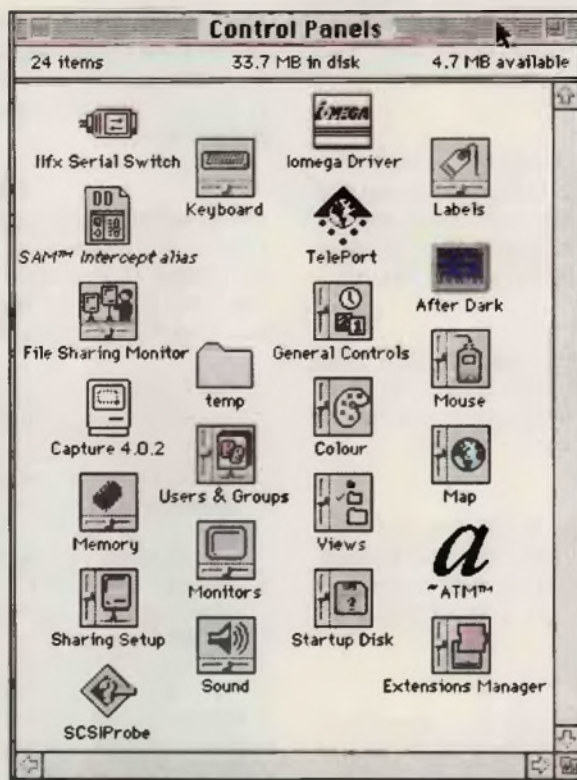
Which?, the voice of the Consumers' Association, selected the Apple Macintosh Classic in December as the Overall Best Buy based on its tests of 'widely available computers'. It concluded that the Classic is 'extremely easy to operate, using a mouse to point at symbols on the screen'. Of course, I heartily concur. But as Mac technology has evolved, the leap in power has extended the learning curve.

This month, we'll talk about the software at the core of that technology, specifically at the System Folder, several Control Panel devices, and aliasing.

Before we go into any detail about the System Folder, it's important to understand what system software is. Computers are only useful if you can communicate with them. You must be able to enter and extract information. Input devices include keyboards, mice (or mouses) and graphics tablets. Output devices include printers and the screen. Disk drives are used for input and output. The operating system is software that runs silently in the background managing all this interaction.

The graphical user interface of the Mac was designed to avoid the complicated commands demanded by IBM's MSDOS operating system. Instead it presents you with 'intuitive' tools like windows, icons, menus, pointers, and a selection device (WIMPS). Much of the 'behind the scenes' software that provides these tools is in read only memory (ROM) chips. The System Folder includes all the rest.

So why didn't Apple simply put everything in ROM instead of burdening you with the System Folder? The



△ Control panel devices are individually summoned via the Control Panel folder

answer is key to understanding Apple's approach and how it affects the way you work with the Mac.

Dedicated

Apple is dedicated to providing each Mac user with the most accessible power its system can deliver. This is not some wild-eyed policy developed by Silicon Valley marketing gurus out to save the world. Rather, it's smart business. The company has demonstrated loyalty to its user base by releasing several improved generations of its system software. Burning the system

software into ROM chips would slow and perhaps in some cases prevent systems evolution. Virtually no-one who has moved from System 6.07 to System 7 does not appreciate the upgrade. Thus, the System Folder and system upgrades are something you have to deal with. But believe me, it's a very small price to pay for the benefits you are likely to garner.

The System Folder

Select 'by Icon' in the View Menu, and examine your desktop. You'll note that the System Folder icon is distinguished with a picture of a miniature Mac. The folks at Apple made this folder different to emphasise its importance and to let you select and open it easily. Opening this folder reveals several subfolders including Control Panels, Extensions, Startup Items, Apple Menu Items, Preferences, and PrintMonitor Documents. Each of these subfolders bears individualised icons. Again, it's because each plays a key role compared to other subfolders.

Fortunately, Apple has added intelligence to System 7's System Folder that precludes the necessity of manually moving files into each of the subfolders. If third-party companies have followed Apple's programming guidelines, files dropped into the System Folder will automatically be sent to the appropriate subfolder. As a precaution, this procedure is interrupted by a dialog box that asks you if this is what you intend. So let's go through the sub-folders.

• **StartUp Items Folder** This lets you run a program or series of programs automatically upon system startup. Simply place applications or docu-

ments (or aliases, which we'll talk about later) into this folder and reboot the system. If you have the requisite system memory, all applications and documents will also start up. You can switch between these applications by click/selecting on the Multifinder icon at the top right of the screen. Be warned, however, that the files in this folder will open every time you turn on your Macintosh. The only way to prevent this is to drag the files back out of the Startup Items Folder and reboot.

• **Apple Menu Items Folder.** Accessories you place in this will appear under the Apple menu (press Apple icon at top left of screen) when you reboot the system. The advantage of desk accessories is that you can use them while you're running another program. That is, in the middle of a word processing document you may need to use a calculator or switch output devices. Go to the Apple menu, select the **Calculator**, perform the calculation, and paste the result into your document.

Switching output devices involves the **Chooser** desk accessory. Chooser is an elegant program but nevertheless a source of much consternation to the beginner. I can count on three dozen hands the number of times users have called me with the complaint that their printer doesn't work — and about 100% of the time it's because they haven't selected the appropriate print driver in Chooser. Again, this seems an unnecessary complication for someone with just a Mac and an ImageWriter, but it gives you the scope to use virtually any kind of output device. All you have to do is drop the appropriate driver into your System Folder, go to the Chooser and select the new device. Compared to writing a `DEVICE=` statement in `CONFIG.SYS` on IBM systems, this technique is pretty simple.

• **Preferences Folder** Most of today's applications software is so full-featured that you are asked to set up a series of preferences to determine how a program operates. Preferences cover the likes of measurement units (metric or English), paper sizes, screen resolution, and window management. Many programs keep track of these via a preferences file in the System Folder. The Preferences Folder acts as a central store for these preference files and minimises system folder congestion that was becoming a real problem with earlier versions of the system software.

• **Extensions Folder** The extensions folder contains what were formerly called INITs and are now called system extensions. System extensions are memory resident programs (that is, programs that are loaded into memory and

remain there while the Mac is running) that increase the functionality of the Mac. On my system I currently run the following extensions: Adobe Type Manager, SAM Intercept, Disk Doubler, Capture, After Dark, SCSI Probe, Teleport, and DiskLight. In a future article we'll describe the functions of all of these extensions. Suffice it to say that there are a host of third-party extensions available. Each extension requires memory, so you have to balance the value of each extension against the RAM you are willing to devote to it. The Extensions Folder also contains printer drivers, Appleshare files, and other device drivers used by the Chooser.

I highly recommend a control panel device called Extensions Manager by Ricardo Batista. This shareware, available from many dealers or on-line services like Compuserve, allows you to turn extensions off and on without going to the System Folder and removing them from the Extensions Folder. If you use many extensions, it could save you loads of hassle.

• **Control Panel Folder** There was a time when a Control Panel desk accessory used to control things like the sound volume, the blinking rate of the cursor, the desktop pattern, and the time and date format. Midway in the development of the Macintosh system, Apple opened the control panel up to third party 'devices'. Unfortunately, such a plethora of nifty devices was released that the control panel accessory took longer and longer to open.

Control devices

System 7 changed all that by replacing the accessory by a control panel folder. The System 7 installation program automatically places an alias (we will get to this eventually) of the control panel folder in the Apple Menu Items folder so you can open the control panel's folder via the Apple Menu.

Some of the key control panel devices bundled with System 7 include:

- Colour, of windows and highlights.
- Map, for time zones, and distances between many of the world's cities.
- Memory, for adjusting the size of your disk cache, turning virtual memory on or off, and setting 32-bit addressing.
- Monitors, for changing characteristics of your selected monitor, like the video card or number of colours.
- Sound, for adjusting volume level of the Mac speaker.
- Startup Disk, for switching between startup volumes.
- Views, for adjusting the way icons and file names appear, the type of information displayed about each file, and whether the Finder calculates and

shows folder sizes.

- **Sharing Setup** for changing your network identity and turning file sharing and program linking off or on.
- **Keyboard**, for selecting from a series of international keyboard layouts.
- **Mouse**, for control of tracking speed and double click sensitivity.
- **General**, for selecting a desktop pattern, the rate of insertion blinking, and setting the date and time.

A few random notes about these devices. Choosing calculate and display folder sizes in the Views Control Panel is a valuable way to determine how the memory on your hard disk is being used but can slow your system down considerably. When you choose not to 'Show' an item in the Views Control Panel, that item will be deleted from the View menu in the Finder window. Don't change memory configurations in the Memory Control Panel unless you have first read about hardware requirements in the Apple documentation.

A number of extensions (like Adobe Type Manager and After Dark) have corresponding control panel devices that determine how they operate.

Aliases

As hard disk capacities continue to grow, one of the vexing problems in dealing with GUI-based systems is finding files. With only a dozen icons, it's relatively easy to pick the one you require. With two hundred icons (the size of my System Folder today), it becomes problematic.

It's also tedious to search for a file used in several different processes. For example, I may write a note about Apple's system software to a friend, decide to use the same note in a newsletter, and then also include it in a PCW column. To save time, I'd like the note to appear in three different folders. But if I duplicated many files like this, I'd soon run out of disk space.

That's where System 7's aliases come to the rescue. An alias is just a pointer to a file and takes up little space. Aliasing basically allows you to create unlimited, almost spaceless, copies of files to make them easier to access.

One major benefit of aliases is the ability to place aliases of your most frequently used programs in the Apple Menu Items folder. Thus you can access your applications from the Apple menu instead of searching through hard disk volumes.

Next month we'll talk more about fonts and the System File, third-party system extensions, and control panel devices, and spend some time on the role of the Macintosh scrapbook.



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BIOS degradable

Karl Dallas seeks your help in spotting rogue BIOS chips, and tells how you can live without a mouse. Also, a useful notepad for Windows, from splendidly named Jim Button.

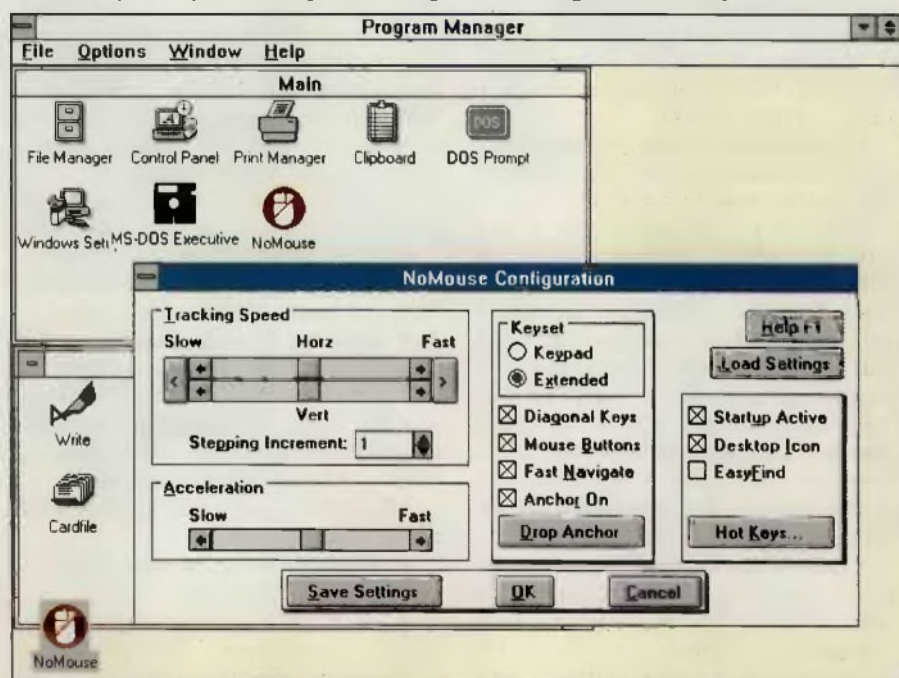
With the proliferation of PC clones from places like Taiwan, we can now no longer assume that hardware that claims IBM compatibility will always stand up under pressure, especially when using mission critical applications like Windows.

This is not merely a question of the prevalence of unrecoverable application errors (UAEs), which are often due to memory configuration problems and shortage of resources. Until the release of Windows 3.1 (at press time we were still being assured that this was really, truly going to be Real Soon Now), the best way round that is to stop using the Program Manager and go back to the Windows 2.0-style MSDOS Executive — less pretty, but using far fewer resources.

But if your system keeps bombing

out for no apparent reason, on a variety of programs, then the finger does rather point at the hardware. The BIOS (basic input/output system) is most likely at fault. This is a set of services, held in ROM and working directly with the rest of the hardware, reading and writing data to devices like the screen or disk, or doing things like the power-on self-test which checks that everything is working before letting it respond to your keyboard input.

As Peter Norton wrote in his famous *Programmer's Guide*: 'IBM has gone to considerable lengths to create a clean and well-defined method for directing the operation of the computer through the ROM BIOS services. As each new PC model is designed, IBM (and any other computer maker who is faithfully extending the PC family) makes sure its



△ Traveller's friend: NoMouse from Abacus fools your keyboard into thinking it's a mouse

ROM BIOS services are thoroughly compatible with those of other members of the family.'

That's the way it ought to be. But while the IBM PC has an open architecture, allowing all sorts of bits and bobs to be bolted on like a Meccano set, that freedom of action doesn't extend to the BIOS, which is Big Blue's copyright. Other companies had to reverse-engineer their BIOS to do the same things in their own non-infringing way.

Some companies have been brilliant at this. One of the most widely used BIOS clones, from Phoenix, performs without any problems that I have been aware of. Others are less compatible.

BIOS watch

The problem, where I (and most other computer journalists) sit, is that we get machines for evaluation only for comparatively short periods, so we don't see the problems that will emerge only after prolonged use. However, recently I have had machines from different manufacturers using the same BIOS, and have been interested to see similar problems developing in all, which is why I suggest the BIOS may be at fault. So I am asking you to institute a BIOS watch.

If you have persistent (or worse, intermittent) problems that defy all logical diagnostics, let me know. I've got one machine that often refuses to boot up unless I turn it on and off very quickly (not usually recommended as a kind way to treat computers). If you have a similar problem, please let me know, and don't forget to tell me the BIOS your machine is using. This is usually displayed during the power-up test.

I need to know other things about your setup, too. Are you on a network, and if so, which? Are you using any extended memory managers, and if so, which? What expansion cards are in your machine? What interrupts and I/O addresses do they use?

You can send your reports to me on CLIX, where I am known simply as karl. I'll report on any patterns which emerge — and name any rogue BIOS which seems to be responsible — in a few months' time.

Interrupt hunger

Speaking of expansion cards, one of the serious limitations of the IBM system at present is that of its interrupts. If you continue to bolt on more and more features, making your simple PC into a multimedia workstation, or hanging it on to a network, for instance, you are almost certain to come up with an interrupt clash. In my experience, this is the

single most common reason why networks fail, and the root of many other problems, as well.

Everything from your floppy disk to your printer port uses interrupts but these are rarely documented, so that when an expansion card manual tells you how to set its interrupt you usually settle for the default setting. This is logical: surely the card manufacturer's guess is a good place to start?

Logical, but wrong. In practice, I have found that (possibly because manuals are two or three seasons behind the leading edge) manufacturers rarely recommend the best option available. For instance, these days most PCs come with two serial ports, yet many expansion cards come set up to use interrupt (abbreviated to IRQ) 3 — which just happens to be the interrupt used by COM2!

Fewer machines have two parallel ports, for some reason, but if you are the lucky possessor of two printers hooked up to your single machine, you can't use IRQ 5, because that's LPT2. That's on an AT. On an XT, IRQ 5 is reserved for the hard disk controller.

What happened to IRQ 6, I hear you ask? That belongs to the floppy disk controller. Here's a brief table of what interrupt is used by which device:

IRQ 3	COM2
IRQ 4	COM1
IRQ 5	LPT2 on AT, hard-disk controller on XT
IRQ 6	floppy controller
IRQ 7	LPT1

which leaves IRQ 2 for your expansion card. Of course, there are higher interrupts than 7 available to your card, but does it use them? The widely used NE1000 and NE2000 network cards can't. The ProAudio Spectrum sound card will only work with IRQ 3, 5, 6 or 7, which as we've seen may all be in use on a fully-featured machine. CD-ROM drives usually offer either 3, 5 or 7. And so on.

If you're on a network, and the card you're using allows interrupts above 7, then configure it for that setting (or get your system administrator to do it for you). On an AT, IRQ 9, 10, 11, and 12 can be used. The AST Ethernet card and Intel's new EtherExpress card use 7-plus interrupts, and they are both software configurable so you don't have to open up the machine to fiddle with jumpers or DIP switches. You'll need to generate a new IPX if you're on NetWare, but it will be worth it if you're likely to be expanding your machine's capabilities in the future.

Another question you may be asked when setting up an expansion card, is what I/O address to use. Here again, the

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necessary information about standard systems is rarely documented, but here are the necessary addresses you must avoid (all in hexadecimal):

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COM2	2F8
LPT1	378
LPT2	278
AT hard disk	1F0-1F8
XT hard disk	320-32F
MDA	3B0-3BB
BGA, VGA	3C0-3CF
CGA, MCGA	3D0-3DF
Floppy disk	3F0-3F7

This leaves some addresses around the 300H mark, but note that IRQ 5 with 340 or 360 will not be available on XT machines with a hard disk.

A simple Windows database

One of the least-used freebies that comes with Windows is Cardfile. It's a handy place for jotting down freeform notes on just about anything, and you can search on the text. But its value is strictly restricted by the 440-character limit on each card. This is just about adequate for a name and address record, but not for the sort of information I usually need to store, which is rarely less than 1K and often more like 5K.

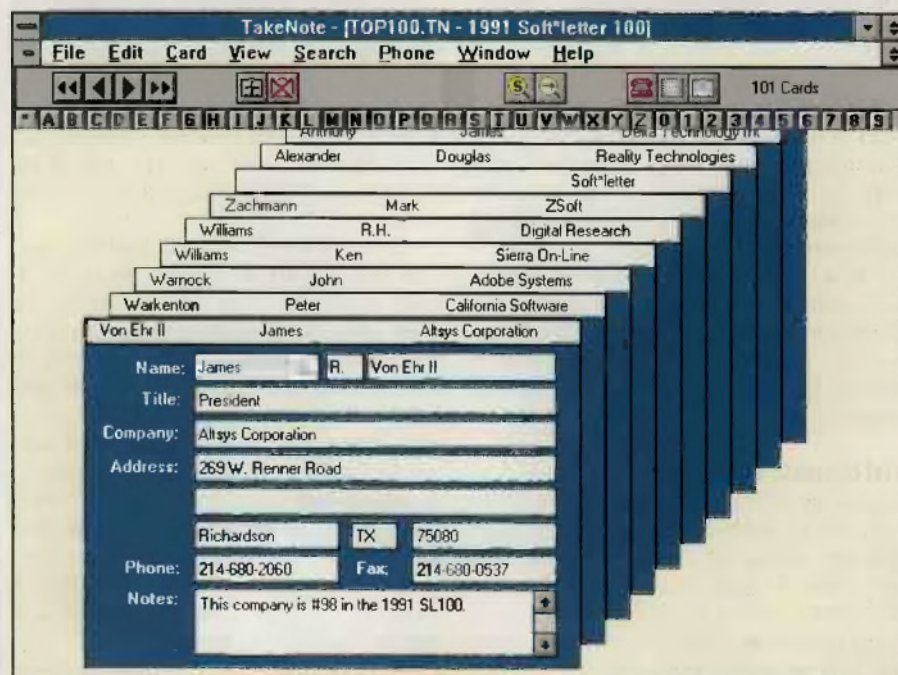
In the days before Windows I used to use a wonderful TSR program called Tornado Notes, which allowed me to take down phone messages or items from magazines whatever program I was using. But until a Windows version arrives, it's not real helpful and I've learned to live with applications like SuperBase and Excel which require me to be in GUI mode most of the time.

I'm something of an enthusiast for Pinboard, as I've demonstrated in articles about how to use it as a Windows shell, and I thought it might provide the answer. Pinboard permits lengthy notes to be stuck on to your screen, but it lacks a search or find capability for filed notes.

Now Jim Button, the shareware user's friend, has come up with a Windows flatfile database called TakeNote, which is exactly what I need. Notes can be up to 8K, and you can search on any text. But it's more than just Cardfile times 18.6, because while it is possible to have a completely freeform file (indexed on the first 20 characters), you can also create specific fields, and index and search on them. Seventeen different templates are supplied, some with labelled fields, some blank for more flexible use.

There are two bits of bad news. The first is that although this comes from the man who gave you the very wonderful PC-File and PC-Write programs, TakeNote is not shareware. You have to buy it in the normal way, with no try-before-you-buy. (The new versions of PC-Write and PC-File have both gone 'commercial' too, by the way.)

Secondly, and more seriously, you can't set up your own templates or edit those supplied. This is a real bummer. The name and address template, preconfigured with all the fields you'd ever need, is perfectly serviceable for the US — but it doesn't know anything about our British postcodes. So it offers you a two-character abbreviation for your state, and a zipcode field. Of course,



△ TakeNote is a Windows flatfile database from the shareware user's friend, Jim Button

since the fields don't specify the sort of data they'll accept, you can ignore the state field and type in your six or seven-character postcode in the space left for zips: there's plenty of room. And a template designer is said to be on its way.

Also, when using the unlabelled field cards, I found I could never remember exactly what order I'd entered data previously, so that what in one card might be the supplier of an item of software, on another might carry the name of my contact in the company. No real problem, of course, but it would be nice to be able to keep the records consistent, especially since it is possible to export the data in dBase format.

Hateful rekeying

I hate having to rekey information I know is already on my system. But I find a number of applications — even in such a supposedly uniform environment as Windows (pause for hollow laughter) — cannot read each other's data files. I can copy from one format to the other using the clipboard, of course, but that's a slow and laborious business, even if I use the CTRL-INS and SHIFT-INS copy and paste shortcuts that work so much faster than a mouse.

And of course the data is still duplicated. Not only does this waste valuable disk space, but it allows data files to get out of step with each other — if I don't remember to update them all each time someone moves, for instance.

What I basically want is for all data programs to read and write the same sort of files, for instance dBase. I'm afraid TakeNote doesn't do that. (No more does SuperBase, my favourite higher-level database.) What TakeNote and SuperBase, and pretty well all Windows databases with the exception of Computer Associates' upcoming dBaseFast, have to do is export and import to and from dBase, which is better than nothing but no cigar. It will also export and import in comma delimited and WordPerfect secondary merge formats, and import in CardFile CRD format. If the 8K notes fields are exported to dBase, they have to be truncated to 254 characters, which is a limitation of dBase III.

TakeNote is a valuable utility that has joined Pinboard and Organiser as a permanent resident on my desktop.

When lapspace is limited

Ever tried to use a laptop with Windows on an air flight, trying to rub the mouse on your leg or your neighbour's drinks tray? Or in any other crowded conditions? Or have you ever experienced that frustration when for some reason Windows refuses to recognise

your mouse, and you don't have time to debug the problem before you do something really very urgent?

Of course, it's possible to configure Windows not to use a mouse, but that's a fairly unfriendly configuration. I tend to use the keyboard shortcuts for task switching, cut and paste, and similar operations, but there are some things only a mouse can do. There is no Windows equivalent, for instance, for the handy GEM capability to emulate the mouse button with the HOME key.

Well, that used to be the case. Now Abacus has come up with NoMouse, a program designed to make your keyboard think it's a rodent. And it doesn't stop you using a mouse at the same time, if you need to.

NoMouse can be placed automatically in your WIN.INI file so that it runs each time you open up Windows, and it can be enabled or disabled at any time by pressing the CTRL-ALT-SPACEBAR combination. Once enabled, the cursor keys will move the mouse pointer up, down, sideways, or (if you press up or down with one of the sideways keys) diagonally. The INS key acts as the left mouse button, and the DEL key as the right button. These keys can be reconfigured.

If you have an extended keyboard, the default configuration uses the separate cursor keys, not those on the numeric keypad, and uses the separate INS and DEL keys, not those hiding under the 7 and 1 keypad keys. This enables you still to toggle insert on and off by using the keypad key. If you have an old-style 82-key keyboard, then you have to disable the mouse temporarily if you want to use INS or DEL.

And that's really it. You'll only need the NoMouse manual if you need to reconfigure the hotkeys. But it does include some useful information that isn't easy to find in the official Windows documentation, like how to move around Program Manager: CTRL-F6 or CTRL-TAB moves from one group window to another, SHIFT-F4 tiles the open windows, SHIFT-F5 cascades them.

Hundreds, if not thousands, of Windows utilities are becoming available, but you'll look a long way before you find one as useful as NoMouse.

Programmer's Guide to the IBM PC and PS/2 is published by Microsoft Press, price £19.95.

TakeNote is distributed in UK by OpenSoft 081-343 9588, price £69.

NoMouse, price £39.95, is distributed in the UK by Guildsoft, The Computer Complex, City Business Park, Stoke, Plymouth PL3 4BB, tel: (0752) 606200, fax: (0752) 606174.

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Indexing with death

William Gallagher had murder in his heart after trying the indexing functions on various word processors. If you want the job done well, he advises, pay a professional.

You've come to the end of eighteen months working on your new book, *The Rise and Fall of the Gibbon Empire*, and it's good. You're very happy with it, and so is your publisher — who just wants your index and will then sign the cheque for delivery of the manuscript. All that remains between you and money is a list of words in the back of the book, and it couldn't be easier, right? The sales pitch for your word processor wittered on about how easy indexing was, and you confidently tell your publisher you'll be round with it this afternoon.

It's not that easy, I'm afraid, and your expensive word processor will hinder you far more than it helps — if it even helps at all.

I've written a test document to try and create some of the most common and the most difficult problems you can encounter, and passed it through a half dozen word processors. Forget speed tests: we're not in that game yet. Indexing is a long job, and we're not in a position where a few shaved seconds means the difference between, say, Microsoft Word and WordPerfect.

No compromises

I am in the position, though, where I have a real document, albeit amalgamated, and I need an index for it. So there are no compromises: if one package doesn't do what I need, I've had to find another that will. The document is already schizophrenic from having been originated in WordPerfect 1.06, 2.01 and 2.03, PageMaker and Microsoft

Word for the Macintosh, WordPerfect 4.2, 5.1 and Word for DOS, Word 2 and WordPerfect 5.1 for Windows, and Pipedream on a Z88. To get an index I put it back through all of them, except the Z88. I like my little Z88, but sometimes you can take masochism too far.

Originally I was going to ignore PageMaker. With each new release a little bit more of a word processor is bolted on, but it really is a single-page layout tool.

It's like a crayon: you can write with it, but you're not meant to. In the end, its indexing features changed my mind and I included it in the testing.

FullWrite Professional

I also changed my mind about FullWrite Professional for the Macintosh. I've used it, reasonably liked it, and know people who swear by it for every-

thing, but it ruled itself out within a minute of attempting to start indexing my document. Loading a plain text (ASCII) version of the document, it refused to get very far before telling me: 'Not enough memory for the conversion'. The document was 180K, loading into a Macintosh Ili with 5Mb RAM — more than twenty times the size of the document. Forget FullWrite for serious work.

Last of the in-and-out word processors was Interleaf. Now that Interleaf the company is supposed to be launching a new version or two, its support has got dramatically better, but I've still had too many bad experiences with its Mac system to take it seriously. The package has some nice features, just not that many, and I ignored it without guilt.

*"All that remains is
a list of words in
the back of the
book, and it
couldn't be easier,
right? The sales
pitch for your word
processor said
indexing was easy"*

So of the ones I used, what did they do that was so wrong? Most word processors tend to leave you with the impression that you've been naughty not building your index as you wrote. Back here in the real world you write your document first, with the avowed intention of getting the words right and informing, enlightening or selling. Filled with noble thoughts of F Scott Fitzgerald or Victor Kiam, you will never stop halfway through a sentence and enter 'i.' and 'j.' in invisible characters at the start and end of your current word.

But from there on in, word processors tend to differ in every aspect — except in being unusable. There are three standard conventions for indexing, and none of them is followed. The three are British, American and International, and strangely enough the British one is generally considered best. It is thought that the next revisions of the other two will bring them more into line with the art as practised in the UK.

That could be good: the heavyweights in this set of word processors, Microsoft Word and WordPerfect, are American, so perhaps matters will improve. Seems unlikely, though: the British standard is called BS 3700: 1988 and has the glorious title 'British Standard recommendations for preparing indexes to books, periodicals and other documents'. Call me picky, but if the British Standards Institute doesn't know that the plural is 'indices', I've no faith in the rest of its findings.

(To be fair, these days dictionaries will confirm that you can use either. But I'm convinced it's the fault of the BSI document in 1988.)

Back breaking

My document was written on so many word processors because it has been a year in the making and I've had to use any machine available at different times. Of the 80 or so pages, 60 are single-sheet proposals and some have three or more pages of progress notes. Eighty pages, with around 23,000 words. And not one index marker.

An index marker is a little code that you tell your word processor to insert near an entry you want to appear in your index. The entry can be a word or phrase of whatever length you want (except in Microsoft Word, which limits you to 64 characters) but it takes just one index marker. All word processors search through the document for these markers, when you tell them to make an index. The associated entries and page numbers are derived and popped into the index for sorting.

While I've no clear favourite for this task, I know I loath Microsoft Word.

Part of the problem is the inexplicable limit of 64 characters (which may not be a problem to you, but I'm verbose, I need more) but mostly the agony comes from the tortuous way you have to insert an index marker. If I were a Microsoft technical author, and were honest enough to want to include the word 'tortuous' in an index to this article, I'd first have to move the cursor to the start of the word. Then I'd have to type in this: .i. — a full stop, an 'i' and a full stop. Then immediately after the word I can enter what I like: a semi-colon is the example in the Word documentation. Now, children, remembering to ask your parents if you can do this, go back and reformat the '.i.' and the ';' into 'hidden' characters.

You could write a macro to do this for you. You could also sit there fuming while trying to stay awake doing it, too. In the real world you'll prop your eyes open and do it rather than take the time to become a mini-programmer.

PageMaker

PageMaker is fairly typical of the other packages in the way you mark index topics. You select a section of text, choose the right menu command, and off you go. In the PM Story Editor you can actually see the index markers shown as a white diamond in a black rectangle before the first word of the text.

With 23,000 words gone through like that, I was ready for the next stage.

There is a confusion of terminology at this point. Microsoft Word can generate what it calls a 'concordance' and WordPerfect can use a file which it calls a 'concordance'. Historically, Word is more accurate, although WordPerfect is more useful. A concordance file used to be one that was generated by a word processor and which contained every word in the document arranged into alphabetical order.

Some might call that an index, and therefore face voodoo rituals from an enraged Society of Indexers.

In WordPerfect-speak, a concordance is a list of words that you want the index to include. It doesn't have to be in alphabetical order, WP just opens it and searches for every occurrence of every word and temporarily marks them for the index.

You can also combine the concordance with a manual entry of index markers, so I didn't entirely waste my time before I found this bit. Using the two, it took me twenty minutes to read through my document on one side of a Macintosh screen and type every word I fancied into a blank document on another part of the display. Coupled with some manually inserted markers,

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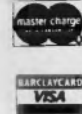
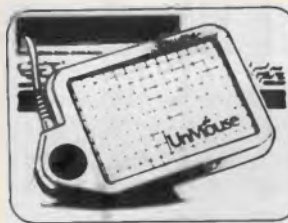
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and the odd red herring (such as words deliberately entered twice, and non-sense words thrown into the concordance) it took WordPerfect 2.03 for the Macintosh 2 minutes 45 seconds to produce a 466-entry index.

Twenty-three minutes in total to make an index. Pity it was fundamentally flawed in one simple but key way.

Happiness and MS Word

The problem was that there are two types of index. That's all, but you'd never know unless you needed the other sort and were using Word. They're called 'nested' and 'run-on'. This is a nested index:

Apples 458
Pears 921
Potatoes 121

That is probably the sort you mean when you talk about an index. It's the sort in the back of every computer manual, so it's familiar, but you know how useful computer manual indices are. They are simple to read, straightforward, and you should quickly be able to spot that the topic you want isn't there.

Run-on is also, sometimes, called run-in. This is a run-in index:

Apples go rotten 876; pears
are baked 4; potatoes go
down well 67.

You see this sort less and less. It's harder to read quickly, but crams all of the information into a much smaller space than the nested type.

Here's where the happiness bit comes in: Microsoft Word asks you which type of index you want before it generates it. PageMaker does it, too, but Word seems to be the only word processor with the facility: if you must have run-in indices, your best option might be to use Word.

In WordPerfect, you can change a nested index into a run-in one using macros. But let's face it, WordPerfect is paid to add-in features, you are not. If Word did everything, I'd stop talking now.

Only it doesn't. Word lets itself down in the rest of the index-building stakes.

Alphabetical order

You shouldn't get this problem now, but early software used to sort by ASCII rather than the alphabet. ASCII (the standard computer numbering system for characters) includes quotes, apostrophes, full stops, ampersands... everything. So you could have a case where 'Amadeus' comes after Zebedee because of the single quote mark before the A. Similar problems still affect PageMaker.

Aldus PageMaker gives you a great deal of control over sorting, letting you choose whether you want 'Mc' to be

treated like 'Mac' for example, but once you use something other than a letter it falls apart. Beyond letters, Aldus seems to sort on a combination of intelligent deduction and idle unconcern, anything beginning with a space going first. Really useful, that. I simply can't count the number of times I've had to include words beginning with spaces.

Next in your PageMaker index comes a symbol. Any symbol. If you use one-off symbols anywhere in your book, they'll come out at the top - and in random order.

Worse, numbers are sorted unintelligently in ASCII order. There is an ASCII code for each digit 0 to 9. There is not, and cannot ever be, a code for, say, 456. PageMaker will sort 456 by looking at the 4 first, then the 5, then the 6. So 3922 will come out before 456 because the initial 3 is less than the initial 4.

To be fair, the PageMaker manual does warn you of this. The suggested remedy is to always write your figures as 0456 and 3922, or 0001 and 1000 etc. That works, but I don't care: it is completely unacceptable. When there are algorithms that can cope with proper numbers, I don't see why I should be forced to even temporarily find every number and change it to that ludicrous format. 'In the year of Our Lord 0234, there were 0865 Gibbons within 0004 kilometres of Rome...'

Major failing

That is a major failing in an otherwise good PageMaker. A failing in every word processor I used was that none gave you a choice of the two ways of alphabetically sorting a list. I don't mean A-Z and Z-A, I mean two ways of doing it from A-Z. They're called 'word by word' and 'letter by letter'.

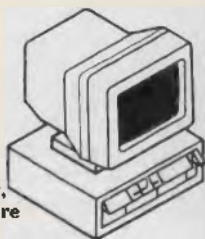
'Letter by letter' sounds painstaking and careful to me, but it's the less intelligent of the two. Two entries in your index are compared, beginning with the first letter of each. If that is identical, then the second letter is looked at, and the third and so on. Spaces are ignored, so this treats each entry as one long word: not unreasonable, but you don't read like that unless you're the one who started the 'WordPerfect', 'PageMaker' and 'LaserWriter' fashion. It doesn't strip out the spaces, it just ignores them. When the sorting is over, each entry looks fine.

However, the sort order is different from that made by 'word by word'. That method is a superset of 'letter by letter'. In exactly the same way, the first letter of an entry is compared to the next entry, and then the second letter etc. The difference is that 'word by word'

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stops the comparison at the end of the first word. If everything has matched up until that, then the shorter word comes first. That means that an entry such as 'word processing' will come before 'WordPerfect'. With 'letter by letter', it is the other way around.

This is a 'word by word' sort:

On line 24, 87
Onions 18
Word processing ... 75-92
WordPerfect 2

And this is the same segment sorted 'letter by letter':

Onions 24, 87
On line 18
WordPerfect 75-92
Word processing ... 2

'Word by word' makes more sense, I think, but there is no standard. The legal and medical professions insist on 'word by word', bless 'em, but until recently 'letter' was done by everyone else. I suspect this was due to the software doing it, rather than everyone having bad taste, but you never know.

It's irrelevant. No word processor I used gave me a choice.

"WordPerfect took some of the drudgery out of the job with its true concordance file"

Concatenating page numbers

The two examples above of sorting also included two different types of page numbering, on top of the normal 1, 2, 3. They had the 'WordPerfect 75-92' one and 'Onions 24, 87'. A human indexer who came up with that segment would have meant that onions are featured on both pages 24 and 87, and that a single discussion of WordPerfect began on page 75 and continued uninterrupted until page 92.

The word processors tested all managed to eventually come up with this sort of page entry in the index, but none was capable of making the kind of decisions taken by the human indexer. Your documents are liable to be aimed at one or two audiences with common references, and mine is no exception. A building called 'Pebble Mill' appears a lot in mine, but almost every reference is unique: two consecutive pages might mention the Mill but not necessarily talking about the same topic.

A human indexer would see that and write something like 'Pebble Mill 24, 25-29, 30'. WordPerfect assumes that you will always want to have that as '24-30' and does it automatically. That leaves you to manually check through your final index and fix it, which is tedious again, but at least better than

Microsoft Word. That, and many others, force you to enter a different index marker if you are going to want to concatenate the pages later.

That is really the single implication that all of these have: if you want an index, you've got to do it by hand. Much toiling over columns of words is required, and features like this one just make the task more arduous while taunting you with the manufacturers' professional looking examples of indices.

Mission impossible

Far from being the easiest and most numbingly uncreative part of writing a document, the index is a painstaking and difficult task. It's also impossible with the software that exists now. There isn't one piece of software that can do

the job, so my only real recommendation must be that if you need an index, get an indexer (a human one) in to do it. Contact the Society of Indexers, 25 Layborne Park, Kew Gardens, Richmond, Surrey TW9 3HB.

From that Society, Elizabeth Wallis' voice shuddered when I told her I was writing about this topic. It appears to be a long-running issue with

them, and I'd say that the only difference between my conclusion and their consensus is that I'm less vehement.

However, since you've probably already paid out hundreds of pounds for your word processor, is there a best of the worst? No. Aldus PageMaker comes closest, I think, but it is not a word processor and won't be for a long time. You would be laying out every single page of your document again if you moved it over to PM.

Deciding factor

Of the actual word processors, the choice as usual comes to Microsoft Word or WordPerfect. The deciding factor is whether the run-in index or the indexable look and feel is more important to you. Word has the edge on features purely because of the run-in option, but I found that WordPerfect was more comfortable to use, and I liked the way it took some of the drudgery out of the job with its true concordance file.

These two heavyweight word processors are equally matched feature for feature, but the look and feel is vital. You could spend hundreds of pounds on a whizz-bang word processor like these and find that you abhor it. That, and what you can do about it, comes next month.



Get your wetware round this...

Steve Cassidy on the need for a sense of proportion, plus some tips on Windows DDE — and a fractional solution.

Wetware. It's a hip term, coined by SF author Rudy Rucker. It's a loose description for the way people think — their programming. I hadn't really thought about the issue of methods of thought, until I spent some time the other week chatting with some trainees. I happened to mention that I was in the last class of my school to be taught how to use a slide rule, and that this had given me a valuable lesson in estimating, and a good idea of the concept of orders of magnitude.

All but one of the trainees looked entirely blank. The non blank one was an engineering student. My point is that there's no benefit whatsoever in being armed with a tool of the subtlety of even the most mundane spreadsheet, if you have no mental handle on numbers.

Anorak pilot

I know that these phrases conjure up some introverted anorak pilot, hidden away in a garret, running ever longer excursions into Fractint on an ever faster machine. But numbers are rarely entirely divorced from the real world. The ability to squint up at the ceiling, mutter a bit, and understand roughly where a calculation should end up, strikes me as in many ways more important than any ability to recall by rote all the functions in the list for your spreadsheet.

Take Standard Deviation, for instance — very nearly my favourite spreadsheet function, after the Wingz scandal (square roots of numbers less than 0.3, apt to crop up in Std Dev problems, were found to be incorrectly calculated in Wingz for Windows). Std Dev provides a measure of how scattered the numbers in your sample are, by comparison with the norm. The bigger the Std Dev, the more varied your input set. At school, I never really understood this deviation — it was hard to build a

model of what was happening in the intermediate steps between data in the set and this 'magic number'.

Armed with a spreadsheet, however, it's child's play to improve one's understanding of the behaviour of any function or mathematical process. Now, after a period of exposure to these things, I think I can come to a ballpark estimate of deviation, given a sorted list of numbers. Likewise an Internal Rate of Return. Unlike friends, whose experience of these things predates the PC revolution, I didn't get this ability from years of thrashing out countless examples, but from a quiet afternoon with the manual, bending each function this way and that to see what comes out.

(While playing exactly that game, I discovered that Excel will correctly report the Std Dev of 6 ones as zero, but of 6 1.1's as 1.88486E-08, which from my understanding of the function isn't quite the right answer, to say the least. Is there anyone out there with a firmer understanding of statistics who can tell me why this might happen?)

On much that front, I'd like to hear from anyone who has had to produce, or seen in action, any 'numeric accuracy tester spreadsheets' — a worksheet which contains a representative sample of numeric calculations, with 'right answers' embedded in the sheet and an overall measure of the abilities and accuracy of the calculating engine of a given product. I thought for a while about doing this following the Wingz story, but rapidly realised that the probability of catching every mistake was minimal, to say the least...

DDE and Excel

The idea behind DDE is deceptively simple: one Windows program can drive another by sending it commands and/or data. In practice, it requires some

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sitting down and thinking about.

The most common use for DDE is to make use of a feature in a package other than the one you started out using. Excel 3.0 has links to Q&E via DDE if you need to access a database. Instructions for Q&E can be embedded in your Excel macros, or just left as an 'environment link' (my term) in which complicated formulae in the worksheet point to the external resource.

Similarly, outside the world of spreadsheets, Superbase 4 for Windows comes with a graph-drawing library delivered as a 'graphics server' application. If Microsoft and others are to be believed, DDE and the operation of DDE links are the direction we should be heading. What's the point in having a gloriously clever, context-sensitive spell checker hidden away in Word for Windows 2.0 when you can't get to it from Excel 3.0?

It should, in theory, be possible to have a bunch of background resources — a database server, a printer server, a dictionary and thesaurus server, and so forth — each of which is callable by one of a number of front end products (a word processing window, a database form window, a spreadsheet window...).

So, how well does present-day DDE tackle the job of handing data and commands to and fro, between Excel and other applications?

Not terribly well. There are some low-level programming limitations concerning the amount of data, in bytes, which may be transferred in one DDE 'conversation', particularly as strings. This need not matter too much if you're linking between shrink-wrap off-the-shelf software packages, because all that I've seen so far incorporate the ability to move data on and off the Windows clipboard. That means the DDE link need only send *commands* to the other application.

SELECT statement

I've seen a use of Superbase 4 in which an Excel macro sends the appropriate SELECT statement to pick up a record which matches some selection criteria laid out in a range of cells on the sheet. The record which matches the choice pops up in Superbase, and then Excel issues an Edit..Copy to the Superbase application, and a local Edit..Paste to pick up the data.

In the case of retrieving records from an external database application (rather than via Q&E), it can make sense to have the database export the data in a format which Excel may read in as a file. Again, thinking of Superbase 4, I have had to move a block of data into Excel by getting Superbase to export the current

selected set of records to an Excel 2.2 format file. This has a particular advantage when taking records out of a database used in a multi-user network. If Edit..Copy in Superbase, and Edit..Paste Link in Excel, are employed, each cell issues an update flag to Superbase which can result in all the records being interrogated having locks set against them — which prevents any of the other users from getting to the record.

So the moral is, examine the system you're producing very carefully. Live updates may sound great in the marketing blurb, but I find that they are seldom required in practice.

'Not spreadsheets really'

Assuming you have obtained the data from an outside source, or perhaps only have two or three cells to import — say, the bottom line of your bank balance as presented from a Windows terminal emulator with a big fat script language, like Dynacomm — you're then likely to end up just sending commands to and fro. The tendency seems to be for other packages to be in the driving seat, and for Excel to do the listening. Given the Excel macro language as a development environment, I can't see any obvious reason for this. Perhaps it's because the DDE link is to do with an activity which, by definition, is 'not spreadsheets really'.

This is a strange bit of evolution, because pre-Windows 3.0 versions of Excel were pioneers of inter-application communication. Excel 2.2 in particular had some truly bizarre facilities for poking characters into the keyboard buffer of non-Windows programs running in Windows DOS boxes. However, the trend may be better understood if one considers the more traditional structure of a lot of other applications' macro or scripting languages.

So, the tendency is for commands to be issued externally. I think this is a very bad idea. It seems to me that the links between the applications are much the weakest part of the assembly, and prone to over-use and consequent aggravation (which, I guess, is another way of saying that none of this happens very fast, even on big machines).

Bright idea

If I am faced with the task of building a link, I prefer to establish the actions as broad headings, and define collections of activities to take place in Excel as Excel macros. Then, the calling script (in Superbase, say) need only ever invoke one Excel external command — the one which runs a macro. This renders debugging far simpler, especially when one's bright idea has

been shown to work, and various bells and whistles start to be tacked on the side of the initial functions.

Which only takes matters so far. Recently, a question cropped up on CIX from a chap who was doing much as I have described as a first stage. All the code for functions to be performed was stored in the script language of the application external to Excel. He was using a DDE channel to build a new spreadsheet each day, from his data.

This is a wonderful thing to be able to do, especially if you leave screen update on and can watch the Excel sheet gradually taking shape under the control of some phantom within the machine. However, it brings us to the core of his problem: each day, the finished sheet needed to be saved, overwriting the previous sheet. That's easy —

`SAVEAS("FINISHED.XLS",1,"",FALSE,"",FALSE)` should do the trick. Except that none of those parameters are used to suppress the Windows dialog box which pops up to ask you whether you're happy to overwrite the previous copy.

There are several places in which Excel may put up a simple dialog like that — just an Alert, really — and the macro language doesn't allow you to automate pressing the button! It's worse if you have loaded and then minimised Excel and driven it from somewhere external, because the system can become locked: Excel displays an alert, to which you must respond, when your other application has turned off the keyboard and mouse! In this case the answer turned out to be to use

`=FILE.DELETE("FINISHED.XLS")` before issuing the `SAVEAS()`, although this should strictly speaking also require a directory to be taken to make sure the file exists, and prevent Excel throwing out the `=FILE.DELETE`.

Say it with Excel

This final strategy promotes my suggestion of packaging these actions within Excel, because although you can issue commands quite sensibly from an external application, it's not nearly so straightforward to cope with the consequences of the command.

The problem is that the 'host' script knows nothing about the syntax or construction of the Excel command in question. It's fairly simple to substitute parts of the string, such as parameters, using the features built in to the scripting language of the program in the driving seat. Some of the more advanced DDE calls permit true parameter passing into the command being built. But getting status codes back, or responding to an Excel error condition, or branching conditionally to execute different bits of

Excel code depending on the value of a cell in the sheet, say, is another matter.

So, in this case, the chap with the problem would be best advised to send a command to Excel like

`=RUN(This.Macro)`
where `This.Macro` is a defined name. The getting of the directory with `=DIRECTORY("C:\MYFILES*.XLS")` and the parsing of the resulting array can be done within a macro sheet.

Fractions

Someone's cracked the task I set a few months ago, to convert a number into a fractional label using 1-2-3 macros. He's George Bonfield, and his macro is listed on page 378. His letter, from Access Information Ltd in Maidenhead, documents the macro as follows:

'Fraction.WK1 contains a macro to convert decimals (such as 1.0625, the example you gave in December's issue) into numbers with fractions — 1 1/16th in this case.

'The macro is fairly self-explanatory. First it gets user input through the `GETNUMBER` command. It then looks at the decimal and decides whether it has a 1,3,7 or 9 as the rightmost digit, in which case it carries out the subroutine `'DIV_NOW'` which returns the fraction without further ado, since it (the decimal) cannot be reduced further.

'But, if the macro finds a 5 as the rightmost digit, it divides the numerator and denominator by 5 as many times as it can, using the `'DIV_FIVE'` subroutine. On the other hand, if the rightmost digit of the numerator is neither a 1, 3, 5, 7, or 9 (it can't be a zero since zero is not significant in the rightmost decimal position), then the rightmost digit is a two and consequently the macro will carry out the `'DIV_TWO'` subroutine, attempting — and completing at least once — the division of numerator and denominator by 2.

'The number of iterations is determined by the number of decimal places in the original number, which is controlled by the values passed to the subroutine by the `FOR` command line. Both the `DIV_FIVE` and `DIV_TWO` subroutines check after each iteration of their functions that the result they will return will be a whole number. If this is not the case, the `FORBREAK` ends the subroutine in question.

'The counters in cells F2 and F3 show the number of decimal places the input number has, and the power of ten of the part of the input number to the right of the decimal point. These are just for reference.

'The macro should work down to about 9 decimal places, after which 1-2-3's scientific notation takes effect. But

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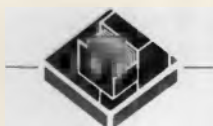
1-2-3 v3 or greater (which I did not attempt to use for this exercise) might produce different results. I thought that a macro would be more powerful than a formula, as I couldn't see any way of

allowing formulae to deal with a wide enough range of decimal places.'

I can think of a way of achieving such a conversion in a formula—but I'll save it until a few more offerings come in.

	A	B	C	D	E	F	G
1	[Press ALT+Z to run macro]						
2							
3							
4							
5	{windowsoff}{paneloff}/rea2..f3~{windowson}{panelon}						
6	{getnumber ""Enter decimal to be fractionalised: "" ,a2}						
7	{goto}a2~{edit}{home}'~						
8	{let f2,@length(a2)-@find("",".",a2,0)-1}~{let f3,10^f2}~						
9	{if @right(a2,1)="1"~#or#@right(a2,1)="3"~#or#@right(a2,1)="7"~#or#@right(a2,1)="9"}{div_now}						
10	{if @right(a2,1)="5"}{div_five}						
11	{div_two}						
12	{let c2,c2&""/"&d2}~/red2~{if @int(@value(a2))>0}						
13	{let b2,@int(@value(a2))}~						
14	{goto}a2~{edit}{home}{del}~						
15	DIV_NOW						
16	=====						
17	{let c2,@string(@value(@right(a2,f2)),0}						
18	&""/"&@string(f3,0))~						
19	{goto}a2~{edit}{home}{del}~						
20	{if @int(a2)>0}{let b2,@int(a2)}~						
21	{quit}						
22							
23							
24	DIV_FIVE						
25	=====						
26	/reg26~				5		
27	{let c2,@right(a2,f2)}~{let d2,@string(10^f2,0)}~						
28	{for g26,1,f2,1,a33}~						
29	{}						
30	{}						
31	{}						
32	{}						
33	{if @value(c2)/5=@int(@value(c2)/5)}{if @value(d2)/5=@int(@value(d2)/5)}{branch a35}						
34	{forbreak}						
35	{let c2,@string((@value(c2)/5),0)}~{let d2,@string(@value(d2)/5,0)}~						
36							
37							
38							
39							
40	DIV_TWO						
41	=====						
42	/reg42~				2		
43	{if @cell("type",c2..c2)="b"}{let c2,@right(a2,f2)}~{let d2,@string(10^f2,0)}~						
44	{for g42,1,f2,1,a49}~						
45	{}						
46	{}						
47	{}						
48	{}						
49	{if @value(c2)/2=@int(@value(c2)/2)}{if @value(d2)/2=@int(@value(d2)/2)}{branch a51}						
50	{forbreak}						
51	{let c2,@string((@value(c2)/2),0)}~{let d2,@string(@value(d2)/2,0)}~						

Fraction.WK1 Lines 9, 12, 17, 33, 35, 43, 49 and 51 have been split into two for reasons of space. The text in the two lines should be entered as continuous



Sense and usability

Keeping things simple is not a simple matter. Kathy Lang gives some tips on how to make your applications friendly.

Time was when 'user-friendly' was the most overworked word in computing. This was, I suppose, an advance on the era when users were regarded, at best, as a necessary nuisance or an irrelevance, and at worst as aliens to be kept at bay at all costs until they were graciously permitted to approach the finished system. But since most programs in the 'user-friendly' era were about as friendly as a sabre-toothed tiger, the term had a hollow ring.

Nowadays developers seem to have compromised on aiming at (and sometimes achieving) something called 'us-

see a 'user image' which is created by the developer, and is very little if at all similar to the parent package.

Just now it is not possible to do this kind of thing in any other type of package; you can set up macros in the more powerful spreadsheets and in a few word processors, but the end user is still actually using Lotus 1-2-3 or WordPerfect or whatever. It is not yet possible to make WordPerfect look as if it were WordStar or vice versa, and even then the tasks being carried out are common to a wide range of businesses rather than being highly specific.



Databases vary in the extent to which you can tailor what the end user sees, but in the most powerful products your control over the way the system appears to the user is total.

Research

A good deal of research has been done on the subject of usability in general. Most of it has, unfortunately, concentrated on aspects which can be measured over a very short period, and little study has

been made of the needs of more experienced users handling more complex tasks. From my own experience of trying to measure usability in 'real life' situations, during a five-year research project I directed, I can tell you it's pretty near impossible.

But enough is known to lay down some basic ground rules. I find it easiest to express these in a two-dimensional form: you need to bear in mind some fundamental principles, such as consistency, simplicity, efficiency and flexibility, alongside a 'profile' of the specific application: the 'Who, What, Why, How, Where, When' of using the system. Some aspects of this profile are covered in the

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ability'. Indeed, the term has become sufficiently respectable for the DTI to recognise it, and as part of the Enterprise Initiative to be promoting a scheme called 'Usability Now'.

Perhaps some of my readers are wondering why they, as users and developers of database systems, should be interested in such matters. Of course, everyone likes products to be easy to use: why should database people be especially concerned? I believe that database systems are fundamentally different, at least at present, in that the end user of a database application may

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
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panel on page 380, and you may find it
helpful to bear these in mind while
thinking about the principles.

Consistency

The biggest single contribution to usability comes from what I call 'the principle of minimum surprise'. One of the major banks has cash dispensers both inside and outside the bank. Those inside oblige you to enter the sum of money required, then insert your plastic card; those outside work the other way. Even in such a simple situation, the users' irritation is considerable, and forcibly expressed!

The more complex the application, the more important is consistency. For example, you should use the same keystrokes or commands for identical operations across an application: an 'I'm finished' command should not be called 'exit' on one menu, 'quit' on another and 'logout' on a third. This principle is a major aim of the Windows and Mac environments, although it is not adhered to by either the operating systems or their applications to the extent that the vendors would have us believe.

The need for consistency extends from simple elements of screen design to system-wide aspects. Colours should be used consistently, of course, and where metaphors exist it's well worth exploiting them. For example, the significance of the red/amber/green traffic

light trio can be very useful; but beware if your application is to be used abroad — the symbolism may not transfer! But it's good to use strong colours for attention-seekers, such as a warning that you are about to sell stock you don't have, and paler colours for background information. Space, too, is important in separating the unlike and binding together the related areas of the screen.

At the other end of the scale, while users like new features, they are often put off by constant uncontrolled updating. And bugs are harder to find, too. In any but the simplest system, proper version control is essential, with the ability to backtrack one release if things go seriously wrong.

Simplicity

For even the most experienced end users, an application should make essential tasks simple to do, though simplicity can mean different things to different people and it needs to be implemented in a flexible way: more on this later. Metaphors which allow people to see computing tasks in terms of things they already understand can help a lot. Since almost everyone in a 'civilised' country knows how to operate a tape recorder, that metaphor for cycling through records has been used to great effect by SuperBase.

The 'buttons' used in Mac and Windows applications are similarly paral-

Who, What, Why, How, Where, When

WHO will be using the system? You need to consider the experience and orientation of the people who will be using your application. You may need to distinguish:

- Users who are not 'computerate' and never will be.
- Beginners who need to become computerate.
- Experienced users, perhaps from a variety of backgrounds

WHAT sort of application is involved? Is the information inherently graphical, or will text-based solutions be adequate? Is the information highly confidential, so that secure access must be provided and screens masked when entering particularly sensitive data? Do a number of people need access to the information at the same time?

WHY is this application being computerised, and what is the motivation of the users? Some systems are intrinsically attractive — for example, people may have to use it properly in order to get paid — while others will be used only if they are made attractive to users. Even systems which people are obliged to use, or have built-in 'carrots', need to

make it easy for people to use them in the right way.

HOW will the system be used? It may be an intrinsic part of a person's working environment, for example an EPOS terminal in a store, or an indispensable accessory like a sales leads and appointments system, or a goodie to be used as needed — for example, a budget preparation package.

And will the user be working alone — at home, perhaps — or with others in a workgroup, either a regular group or project-based, or even interacting regularly with a client?

WHERE will people use the system? Perhaps it needs to be highly portable — for a sales rep, for instance — or rugged, for use in mines or on building sites, say.

WHEN will the system be used? Will people use it all day, every day, or just for particular daily tasks, or only once a month or even less often? By and large, the more often people use a system, the more they need fast, effective shortcuts, whereas occasional users need much more prompting and greater simplicity.

leed in lifts, vending machines, car radios... Some metaphors may be particularly relevant to an application, for example proof marks in the publishing packages. But you have to be careful: 'a picture tells a thousand words' is not a cliché for nothing, but it must tell the *right* words.

Another aspect of simplicity is 'forgiveness'. Users must be able to undo their mistakes, usually as quickly as possible. For instance, if you are using dBase, it is usual to read a complete screen of user-entered information. But you can force dBase, by using the VALID clause, to check each field as it is entered, to allow the user to correct errors as they appear, and avoid the need for excessive 'screen navigation'.

And if you possibly can, provide an 'Undo' facility that stores several levels of activity: if you put the actions performed on a stack, it is not difficult to allow backtracking quite a way. I always find that, with just one level of undo, what I wanted to revoke is always the last-but-one thing I did.

Efficiency

Such 'forgivingness' is also, of course, an aid to (user) efficiency. Perhaps even more important in this area is re-entry of information lost when the system goes down. Sometimes, it is possible to use 'audit trail' techniques to recover the lost data automatically, or at least with some user intervention, rather than complete re-keying. An audit trail is of great value in other ways. It allows managers to establish responsibility for mistakes, exceptional actions, and good initiatives.

It also may allow them to monitor activity in progress: where a group of salespeople are taking telephone orders, for example, a manager's screen can be set to show orders as they come through. Where individual order levels are sometimes small, a threshold can be set. And if the system is running a true or pseudo multi-tasking environment such as Windows or DesqView, the monitoring can be carried out in a window taking up just a small portion of the screen, alongside other applications.

An audit trail should also provide invaluable help in tracking application



△ The tape recorder metaphor in SuperBase

errors. They *will* occur, however well-written your database system — the only bug-free software is no longer being run. And users will *not* write down error messages, however much they are browbeaten — they just want to get going again in the shortest time.

That's because they rightly regard



△ Text windows can be very effective (Fox Pro 2)

their time as important, so another essential is to allow them to quit out of tasks which are either performing in an unexpected way or simply taking 'too long'. But it's important for the user to know what is being undone or left, and in some cases it may be impossible to allow a task to be abandoned without compromising data integrity.

Predictability is especially important when users are concerned about the length of a task, and the vogue for showing a bar indicating the percentage completion of the current task is welcome. But you need to be careful with that, because you will probably use a standard length bar no matter how long the absolute time taken by the task, and this can itself be misleading.

If a task is inherently lengthy, it's worth warning the user and giving the

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option to cancel. But make sure the user is around to reply. A popular desktop publishing program asks if you want to print 'hidden' pictures (hidden to speed screen display) *after* you have hit the OK button and gone to make a cup of coffee. Many's the time I've returned 15 minutes later to find the print has got no further than that prompt!

Careful design of screens which allow users to set up a task can help in other ways too. Such set-up processes are often hierarchical, so it is important to display questions in large enough chunks. A user who gets to question ten in a sequence and finds he has to go away and check the answer is an unhappy as well as an inefficient user. And once a set of questions becomes nested — as they often will if a screen is to be clear and uncluttered — it's vital to show the context.

Experienced users welcome shortcuts, using keystrokes as well as mouse-activated commands, and here again windows are invaluable in providing a short prompt when necessary.

Data windows can also be invaluable in data validation. When checking a field against a set of predefined codes, or seeing the context when choosing between two records with the same name field value, and in a dozen other situations, windows can be invaluable — especially if you make it clear which are there to provide background information and which form the current data checking details. Where data needs to be entered into the current record from a checklist in a window, the user should be able to transfer it without retyping. And to help you adapt those details as the system develops, checklists should be stored in files, not in the program — that helps your efficiency!

Flexibility

Most people find that on-screen help is a great aid to flexibility, since it allows novices access to extra information not needed by experienced users. But even with the tools which most database packages provide, writing a complete help system is a major task — a database in its own right. It's usually better to write the system to match the users' needs and tasks so that, by and large, both help and documentation are unnecessary. If you achieve that, you can concentrate your help system efforts on the really tricky areas. And for those, it's particularly helpful to provide references to the documentation, so that if the on-screen explanations get too tough, or a screen-at-a-time is not the best medium, people can find more explanation without another hunt for the relevant details.

Perhaps the hardest aspect to build into a system is exploration. When people first use a new application, they tend to concentrate on just that part of it which is obviously and immediately useful to their tasks. They don't often, even when they've got comfortable with the system, say 'there must be a better way'. About the best way to encourage the imaginative use of an application is to provide a quick-reference card with all the features available. This ensures that users are exposed to features they don't currently use when they check the use of those they know exist. But you have to be a bit *canny* about this if there are parts of the application which are restricted to the managers or more senior staff — forbidden fruit is a permanent temptation to some people!

Conflict

Another problem with flexibility is that it often conflicts with simplicity, the standard trade-off between power and ease of use. This is perhaps clearest in reporting. Simplicity requires that, if possible, users should not be exposed to the field names used in the database. But flexible reporting virtually requires that they should, especially if you use Query By Example methods to set up reports. The ability to have complete user control over reporting also prohibits many clever space- and time-saving techniques of coding data.

Users' expectations grow and change as the system develops. It's impossible for people to envisage everything they will need from a database system before they have even a prototype to work on. If you expect that, then you will simply be implementing their manual filing system, which even if it is the best in the world cannot hope to give users the goodies that a database can. Then, the application itself will change, in qualitative ways which will need to be reflected in the system. Finally, the outside world will change too. No database system is used in a vacuum; the competition will also have an impact on its usefulness, so you need to build in feedback mechanisms to see that the application can develop as needs grow.

Feedback

Anyone who has done a good deal of development work already will have their own hobby-horses about what makes for usability. I very much hope that this article will generate comments and suggestions which I can pass on to others in subsequent issues.

DTI Usability Now! project: (0509) 264083. Ring for the 'Guide to Usability' and their quarterly newsletter.



Blind faith

In an effort to keep in touch, Dan O'Brien returns to the cult of the Microwriter to help him and the RNIB write a program to emulate a Braille typewriter for the PC.

The really brilliant thing about the crazy early weeks of the micro-revolution (when it was just Woz, Jobs and me in the garage) was that everyone who had a personal computer felt somehow intimately connected with them. Perhaps they had built them from scratch, and had absorbed their essence that way; they certainly knew every nook and cranny of the 64K-max of software that came with the thing. They felt nearer to the metal. They could predict what it would do next, even if it was something bizarre and unnecessary. They knew their machines inside out.

Out of hand

It doesn't happen these days. Oh no. Just like mathematics, which got out of hand around 1920 when the last person who knew the entire discipline back-to-front died, personal computers became impersonal when even the professionals admitted they didn't know what was going on under the boot. For instance, broken programs which have no interest in device drivers suddenly start working if you change the order of commands in your CONFIG.SYS, and no-one knows why, and no-one knows enough to discover why in a finite time. Techies (and journalists in their turn) shrug their shoulders and report simply that this behaviour 'automagically' (to use the American term for it) occurs. Previously, people knew computers; now we spend most of our time just observing them.

Hackers may have been separated from the metal, but they do still want to keep in touch. They get close to their machines these days through speed. The faster information can get out and in, the better the conversation and the closer you get. Programmers love big screens to show all that information, and are constantly searching for faster ways of inputting data.

Which brings me, somehow, to this month's program. It has rather a bizarre history. Many years ago, when most portable hardware in the computing industry had to be carried in hods, like bricks, a small, light, handheld device called the Microwriter appeared. This was an input device, comprising a small LCD screen and five keys arranged in a three-quarter circle to match the positions of fingers on a relaxed right hand. It worked as a chording typewriter similar to those seen being used by stenographers in American courtroom dramas and *Airplane!*. Data was entered by pressing the five keys simultaneously using combinations that were designed to mirror the shape of each letter.

Because one's fingers never left their 'home keys', the Microwriter was much faster than a traditional keyboard. Once the patterns were committed to memory illuminati could swiftly get up to dictation speed and beyond. Another benefit was that you could have the other hand free — and you could use it anywhere. Press conferences were for a few months filled with clusters of journo's all mysteriously toying in their trouser pockets during major announcements.

A bit too British

The Microwriter was an ingenious invention, but was unfortunately a bit too British to succeed. It remained a cult rather than the mainstream device. As a firm opponent of hardware solutions, it annoyed me that the company never released a software equivalent, a driver that would allow you to use Microwriter chords on the numeric keypad of a PC, say — but I never pursued the thought.

Until, that is, about eighteen months ago. It was about then that a letter was passed to me by a colleague, Robert Schifreen. It was from a gentleman who had offered to write a public domain program to emulate a Braille typewriter

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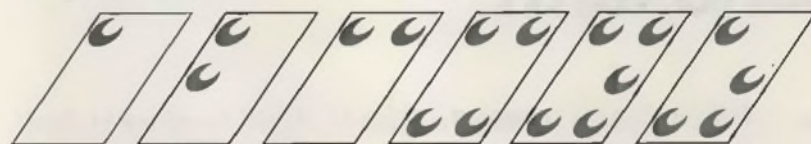
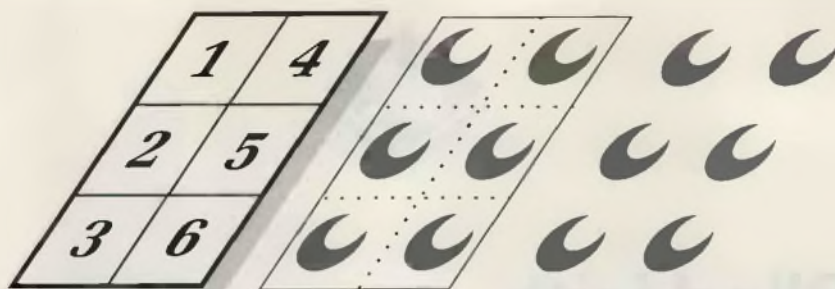
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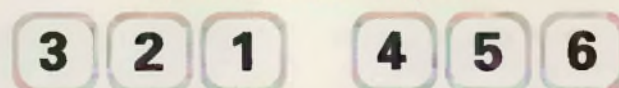
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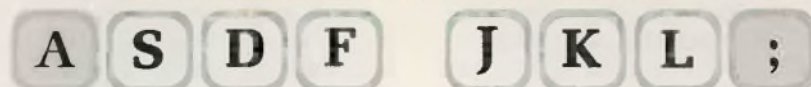


A B C X Y Z

Conventional Braille Keyboard



Braille keyboard-represented on a Qwerty keyboard.



on a PC for the Royal National Institute for the Blind. His first attempt didn't work; could we work out why?

The diagram above shows what the program was attempting to imitate: a six-key typewriter, three keys placed under the fingers of each hand, all being pressed in combinations to print the familiar domino patterns of Braille. The similarity between this idea and the Microwriter's chords should be readily apparent; essentially, the only difference is that the Braille patterns are quite abstract, based on the letter's position in the alphabet. Rather like 19th century binary, in fact.

Traditionally, Braille typewriters were mechanical, with the pressure required to make an impression acting as an impediment to fast typing. On a PC, there's no reason why a professional Braille typist couldn't exceed even hardened typing pool aficionados.

PC problems

A commendable aim, then; unfortunately, its implementation on a PC throws up particular problems. A routine like this requires us to detect keystrokes in combination. This means detecting both key presses, and key releases. The keyboard controller in PCs generates codes for both of these, but the operating system expects everything but the shift, control, alt and lock keys to be simple, one-off characters. The BIOS duly converts anything it receives into a string of buffered keystrokes.

You can find out what's been pressed by asking the BIOS (INT 16h with AH=00), but it provides you with no information as to when it was pressed — or whether it is still being pressed now. We want, also, to insert new values into the keyboard buffer when the chord is complete. And finally, we need to tell the computer to ignore certain keystrokes coming from the keyboard: namely, all those home keys.

The INT 09h solution

These demands occasionally crop up individually, in games programming, key press fakers and the like, but rarely all together. Each one of them has only one solution for a program that wants to run on every machine from the XT upwards — to use INT 09h, the hardware keyboard interrupt for the keyboard.

INT 09h is about as close a programmer can get to the hardware of a PC with his or her clothes on. It's also a pain to program and debug. Programming it is difficult, because you are provided with no help from the BIOS in one of the situations where a consistent interface to the hardware (which is what the BIOS is meant to provide) is an absolute must.

The chip that provides keyboard data on IBM computers has varied on every update to the range: in XTs it is a humble 8255A, on enhanced keyboard ATs it is an 8042, and on PS/2s it's the custom IOSGA. If you're writing for INT 09h, you have to cope with every

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eventuality — on your own.

Unfortunately, if you want to access both key press and release codes (which all the controllers send — a key release is just a key press scan-code with the top bit set high), or hide keys, or mess around with buffers, this is the level you are thrown in at. And debugging these monsters isn't easy either.

Starting from scratch

Faced with that, it was understandable the RNIB's programmer might have problems spotting a bug. And in cases like this, where the idea is simple, but debugging it is not, it's sometimes easier to re-write from scratch. Which is what I did with the Braille emulator. The original, INT 09h listing is shown in Listing 1. While the code here is mine, the acclaim goes to the RNIB programmer, principally for having the excellent idea of using CAPS-LOCK to activate the Braille entry system — a key whose state is easily detected (just a peek at 0040:18, bit 6) and which otherwise is rarely used.

My own paltry addition to the design of the code was to add two extra control keys, on either side of the 'SDK'/'JKL' entry keys, which are there principally to bring the total number of combinations up to a digitally pleasing 255. They're also useful for clearing up some Braille ambiguities — specifying whether you want a left or right-hand bracket for example. Given the abstract nature of the Braille code being typed, I even at one point considered using all eight keys to learn how to touch-type ASCII in binary form. Instant byte entry — how close can man and machine become? Plus I'd be able to count on my fingers up to 1023.

Unfortunately, all this intimacy with computers was not matched with a closeness of contact with our original programmer. His (I'm pretty sure it was a he) details were destroyed in one of those low-level formats of an office desk that one instantly regrets (why doesn't anyone insist on regular back-ups of PostIt(notes?). Similarly, the RNIB has no record of him, apart from a possible name.

So, Steve Richards, if you're out there, the traditional Low Level 03CH quid reward is yours.

All about INT 09h

Meanwhile, the two programs I've sketched out in Listings 1 and 2 should tell you almost everything anyone should want to know about INT 09h. The first routine is the quick and dirty method. INT 09h is entered with the scan code in the 80x86's port number 0x60h. If you want to handle this your-

self — in other words, prevent the BIOS from inserting it into the buffer — you need the code listed under the 'chuck' routine.

For inserting one's own data into the keyboard buffer, use the code under 'plopkey'. This picks up the information on the current position of the keyboard buffer, stored in 0040:0080 (start offset in segment 040H) and 0040:0082 (end offset), and uses that and the head pointer (0040:001A) to insert, as surreptitiously as possible, a new ASCII code.

As you can tell from the number of BIOS data area references, this is the Devil's work, and will fall over if you have an extended keyboard buffer TSR. To save space, I've also left it a mystery as to what the routine does when the buffer's full. WaggleBleep, currently unoccupied, is the routine called in this situation. The TSR packaging, similarly, is as minimal as can be. The rest of the code is a simple algorithm to keep an eye on eight keys and reflect their on/off status in 'pressed' — this is the portion to exploit for simple games programming.

For those of you who'd rather not get too intimate with their machinery, and are happy for their code to not work on XT's or AT's without enhanced keyboards, the 80286 code in Listing 2 should be used as a replacement for these routines. It exploits the belated addition in the AT of BIOS support for low-level keyboard work. This is accessed by trapping INT 15h, AH = 04CH, which is called by the default INT 09H handler each time a keystroke is received. The keystroke is in AL, and the carry flag is set on entry.

The protocol is simple enough: if you want to change the keystroke, change AL; if you want the keystroke ignored, set carry. What you can't

control, unfortunately, is the shift-status of the keystroke. So, in this version, the Braille for '!' has had to be rendered as the keystroke for '1'. A better solution would be to use another AT BIOS extension, Keyboard Buffer Write (INT 16H, AH=05H, with CH=scan code and CL=ASCII code).

Automagic

Listing 2, as I say, won't work on PC's or XT's as they don't have the BIOS code (or the 80286 required to run it). The obvious decision would be to test which one will work at run time (by calling the system configuration call — INT 15H, AH=0C0H and looking at ES:[DI+05H], bit 4 — it's set if you can use the XT code), and install that. Indeed, Listing 1 shouldn't work at all on AT's upwards — the code in 'chuck' is supposedly PC/XT specific. It does though. Automagically, I guess.

Many thanks to all at Laser Personal Computers of Esher (0372) 467778, who kindly loaned Low Level a Laser 386SXE after our own PC blew up.

If Steve Richards or anyone else wishes to get in touch with Low Level they can do so on 081-785 9973, or by writing to dobrien@cix.compulink.co.uk.

Listing 1 8086 Code BEGINS

```
; See text for full description
code segment para public 'code'
assume cs:code
org 0100h
INTNO EQU 09h; Hangs off INT 09H
begin: jmp init
tsr:
pressed DB 00
total DB 00
keys DB 31,32,33,36,37,38,39,30
;Bitmap representation of Braille - note
; bit patterns within the series
bits DB
009H,00CH,018H,036H,028H,01CH,03CH,02CH,014H,034H
DB 00AH,00EH,01AH,03AH,02AH,01EH,03EH,02EH,016H,
036H
DB 04AH,04EH,05AH,07AH,06AH,074H
DB 06H,024H,064H,04H,026H,067H,0E6H,046H,062H,
042H
;Ascii equivalents - 'W' is out of place,
because it
; didn't exist in 1972 French Alphabet...
ascii DB 'ABCDEFGHIJKLMN O P Q R S T U V X Y Z W
; , . : ; ' " ~
newInt:
push ax ; you
push bx ; can
push cx ; never
push dx ; be
push ds ; too
push es ; careful
xor bx,bx
mov es,bx
mov ax,es:[0417h] ; CAPS locked?
and ax,64
jne dobr2 ; Nope, then go through stack
again
old: pop es
pop ds
pop di
```



```

pop cx
pop bx
pop ax
db 0EAh ; FAR JMP
intlo dw 0
inthei dw 0

dobr2: in al,60h
push ax
dobraille:
mov ax,cs
mov es,ax
mov ds,ax
pop ax
mov ah,al
and al,07Fh
mov cx,8
mov di,offset keys
cld
repne scasb
jne old
mov al,01h
ror al,cl
or ds:[byte ptr total],al
test ax,08000h
jns onkey
not al
and ds:[byte ptr pressed],al
jmp done
onkey: or ds:[byte ptr pressed],al
done: jnz chuck
mov cx,ascii-bits
mov di,offset bits
mov al,ds:[byte ptr total]
repne scasb
jne nowt
mov al,ds:[byte ptr di+(ascii-bits-1)]
plopkey:
mov bx,040h
mov ds,bx
mov bx,ds:[01Ch]
push bx
inc bx
inc bx
cmp bx,ds:[082h]
jne notEnd
mov bx,ds:[080h]
notEnd: cmp bx,ds:[01ah]
je waggleBleep
mov ds:[01ch],bx
pop bx
xor ah,ah ; No scancode inserted
mov [bx],ax ; - just ASCII

nowt: mov cs:[byte ptr total],00
chuck:in al,61h ; acknowledge
keyboard
mov ah,al
or al,80h ; by setting bit 7
out 61h,al ; and telling it so.
mov al,ah ; reset it,
out 61h,al ; too.
cli
mov al,20h ; send end-of-interrupt
out 20h,al ; cookie to 8259A
sti
pop es
pop ds
pop di
pop cx
pop bx
pop ax
iret ; return to whence
came.
waggleBleep: jmp old; Insert 'buffer full' here
tsrEnd:

init: mov ax,cs
mov ds,ax
mov ah,35h
mov al,INTNO
int 21h
mov inthei,es

```

```

mov intlo,bx
mov ah,25h
mov al,09h
mov dx, offset newInt
int 21h
mov ax,3100h
mov dx,(init-tsrl)/16+17
int 21h
code ends
end begin
8086 CODE ENDS
80286 CODE BEGINS

```

Listing 2

```

; BRAILLE - INT 15H version...
; (change only where necessary)
.286
code segment para public 'code'
assume cs:code
org 0100h
INTNO EQU 15h; Hangs off INT 15H
begin: jmp init
tsr:
pressed DB 00
totalDB 00
keysDB 31,32,33,36,37,38,39,30
bitsDB 008H,00CH,018H,038H,028H,01CH,03CH,02CH,
014H,034H
DB 00AH,00EH,01AH,03AH,02AH,01EH,03EH,02EH,
016H,036H
DB 04AH,04EH,05AH,07AH,06AH,074H
DB 006H,024H,064H,04H,026H,067H,0E6H,046H,
062H,042h
; ASCII is now the scancodes for the letters...
asciiDB 01EH,03CH,02EH,02CH,012H,021H,022H,023H,017H,024H,025H,026H,
032H,033H,018H,019H,010H,013H,018H,014H,016H,02Fh,02Ch,015h,02Ch,011h
DB 027h,027h,034h,033h,002h,01ah,01bh,035h,003h,00ch
tempDW? ; temporary store for AX
newInt:
push ds
push es
pusha
cmp ah,04fh ; is it INT 15H, AH=04FH?
jne old
xor bx,bx
mov es,bx
mov bx,es:[0417h]
and bx,64
jne dobr2
old: popa
pop es
pop ds
db 0EAh
intlodw 0
intheidw 0
dobr2: push ax
dobraille:
;....
;.... (from old program)
;....
plopkey:
xor ah,ah
mov cs:[temp],ax
popa
pop es
pop ds
mov ax,cs:[temp]
mov cs:[byte ptr total],00
stc
retf 002; IRETs with changed flags

nowt: mov cs:[byte ptr total],00
chuck:
popa
pop es
pop ds
clc
retf 002
tsrEnd:
; etc...
; ....
80286 CODE ENDS

```


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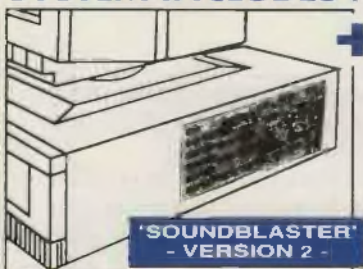
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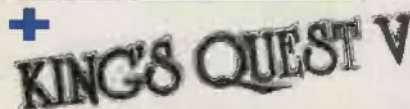
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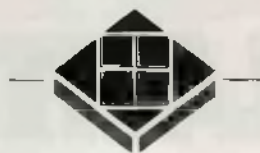
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Going macro biotic

The barriers between applications are set to break down further, allowing the Windows environment to come ever closer to being an organic whole. Ken Morse reports on new macro technology just revealed by Microsoft — and how IBM is fighting back with OS/2.

Microsoft has finally revealed the technology that will provide a crucial piece of its 'Information At Your Fingertips' (IAYF) vision. That technology, called the 'command architecture', will supply the glue for integrating applications from diverse vendors, even to the level of allowing one program to invoke macros within another program and vice versa.

The promise of the command architecture is to let applications communicate among themselves, with the operating system, and ultimately over networks to other programs. In the IAYF vision, it should be possible to program a set of applications to perform complex sequences of tasks.

Macro manager

A macro manager will be provided at the end-user level in a future version of Windows, to let users record and play back commands within, between, and among various applications. Users would be able to look at the macro script in a number of ways, including viewing it as a series of storyboard-like panels that represent each mouse event or command. An alternative would be to see the script in Visual Basic statements to the Macro Manager's underlying Basic engine. The same Basic engine will be the cornerstone of Microsoft's global macro language for Windows.

The Basic engine provides the necessary system-wide functionality and exposes a set of interfaces for which Microsoft developers can create 'wrappers'. Visual Basic, the Macro Manager, and the Windows global macro language are wrappers in that context.

Microsoft's still-secret 'Cirrus' database also contains this Basic engine, according to sources. It allows users to write applications in a language similar to Visual Basic, but with extensions

such as SQL support.

The global macro language will provide still another level of programmability, one for use by more sophisticated PC users and developers. ISVs will be able to write their own tools and global macro languages, because there will be a level of programming interfaces lower in the system than Microsoft's Basic engine. In fact, the Basic engine will use those interfaces.

They will be provided by the upcoming Version 2.0 of the Object Linking and Embedding (OLE) specification, which is being co-designed by Lotus, Aldus, WordPerfect, Micrografx, Corel, and Hewlett-Packard. These OLE command interfaces will provide the programming 'hooks' to let ISVs provide viewers, browsers, command editors, and languages.

Key to OLE 2.0's command interface will be a system-level database where compliant applications will 'register' the commands available in their internal macro languages and menus. With Microsoft's Macro Manager, and conceivably with tools from other ISVs, users will be able to browse and use these registered commands. HP will likely use the command interfaces in OLE 2.0 to eliminate the need for a separate NewWave developer's kit.

Microsoft hopes to make OLE 2.0, which is likely to require a new release of Windows, available to developers during the summer.

OS/2 fights back

IBM is adding its own 32-bit Windows component to OS/2 2.0 in an attempt to woo developers away from Microsoft. It is giving OS/2 2.0 the ability to run Windows 3.0 applications recompiled for 32-bit mode. IBM, which used the Micrografx Mirrors development tool, hopes to offer developers an easier and

quicker path to upgrade existing 16-bit Windows applications before Microsoft ships Windows NT.

IBM believes its strategy can exploit the fact that developers will have to put a lot of effort into upgrading their Windows 3.0 applications to work with Win32, Microsoft's 32-bit API.

Their applications can be compatible with the huge base of Windows 3.0 applications, take advantage of OS/2 2.0, and be upgraded with little work. Microsoft's Win32 API, on the other hand, will use extensions that would require current Windows applications to be rewritten for 32-bit operations.

Microsoft is already sending out documentation warning developers of compatibility problems between Win32 and Windows NT.

MetaWare Windows kit

Extending its large family of compilers further into the field of graphical application development, MetaWare recently rolled out a 32-bit programming toolkit for Windows. The MetaWare Windows Application Development Kit (ADK) allows developers to write, debug, and run true 32-bit Windows 3.0 programs using the company's High C compilers.

The new release includes a binder utility, a make utility, a 32-bit dynamic link library supervisor, a memory configuration utility, several 32-bit libraries and header files, and a source-code debugger. Developers can use the ADK to revise 16-bit Windows applications with minimal rewriting to take full advantage of 32-bit protected memory without the use of a DOS extender.

Adobe upgrade

A quicker and easier-to-use version of Adobe's Type Manager for Windows is scheduled to ship. ATM 2.0 will perform font rendering on 386 or 486 ma-

chines at twice the speed of Version 1.0, Adobe said. Users running ATM on a 286 will see no difference in speed, but all users will benefit from Version 2.0's enhanced printer support and simplified font installation. Also, ATM 2.0 will be Windows 3.1 compatible.

With a Hewlett-Packard LaserJet III printer, ATM can save time and eliminate the need to download fonts by deferring to the printer's fonts with the same name. On PostScript printers, ATM will automatically download any newly installed fonts to the printer.

ATM 2.0 for Windows will ship for \$99 and will include the Times, Helvetica, Courier, and Symbol Type 1 outline fonts from Adobe.

Multi-platform GUI tools

A self-funded startup, out to prove that small, innovative companies still have a place in the software industry, plans to release a new cross-platform GUI programming system for Windows, OS/2 and Unix. Guideware's WinTRAN is a set of C language tools for the building of applications that can be ported to multiple GUI platforms. WinTRAN will compete with cross-platform development tools from XVT and Visix.

Under development for nearly two years and in beta test since November, WinTRAN has two main elements: an Application Builder and an Application Server. The former is a programming workbench for designing, compiling and running applications; the latter works with a run-time module configured for each GUI platform.

The initial release will include a Windows 3.0 run-time module, to be followed by an OSF/Motif run-time module. The company intends to release servers supporting the Mac's System 7, OS/2 Presentation Manager and Open Look by the end of 1992.

The first beta version of WinTRAN looks promising and operates like Visual Basic, but for C. But it does need more debugging and fine-tuning and will not be released until several key customers are satisfied.

NT demands symmetry

Microsoft has announced that the version of Windows NT that hits the streets will support symmetrical multiprocessing systems and no others. The current pre-beta version will require only minor driver changes to support symmetrical multiprocessing on the Compaq SystemPro. Many other systems, however, will not support symmetrical multiprocessing under NT without major hardware upgrades or work-arounds being carried out by the manufacturers. The SystemPro uses



Compaq's proprietary Flex/MP architecture. Many competitors use the C-bus design which is more asymmetrical and used in systems produced by DEC, Mitac, ALR and Everex.

Microsoft's definition of symmetrical — all processors being equal peers in all respects, rather than having one serve as 'master' and the others as 'slaves' — excludes machines that do not meet rigid requirements. Even the SystemPro does not currently meet all of Microsoft's strict symmetrical multiprocessing criteria. The SystemPro is

△ Compaq's SystemPro is 'equal': that is, it's symmetrical, but not quite as symmetrical as Microsoft would like

symmetrical in nearly all respects, except that one processor is assigned to process interrupts. This problem can be overcome by writing system-level drivers similar to device drivers, customisation which Microsoft is leaving to OEMs in much the same way as it leaves machine-specific DOS systems work to OEMs.

Windows NT is inherently a multiprocessor system and will run on machines with either one or several main processors. Applications software for Windows NT will run on either type of system with no modifications.

Depending on how symmetrical a multiprocessor PC is, the work needed to write those drivers is likely to range from difficult to impossible. Some hardware vendors may decide it is not worth the effort, thus leaving some customers high and dry.

OOP for OS/2 2.0

Despite all the talk about sharing reusable code in object-oriented programming systems, it has been difficult to share objects written with different C++ compilers, not to mention those written in different languages such as SmallTalk.

IBM has taken a step to remedy the problem with OS/2 2.0. The company has quietly introduced an object model in OS/2 for writing class libraries that can work with multiple languages and applications.

The System Object Model (SOM) first appeared in October in the 6.167 beta version of OS/2 2.0 as a component of the Workplace Shell desktop environment. All the objects on the OS/2 2.0 desktop were created using SOM. OS/2 2.0 includes a run-time SOM module, and IBM also includes development facilities for SOM with its set of OS/2 tools.

The run-time SOM module serves as a pre-processor that allows unmodified compilers to use SOM objects. IBM is encouraging a number of OS/2 compiler vendors to build native SOM support into their languages, which would allow them to use SOM objects directly. Borland is working with IBM on this aspect for use in its compilers.

SOM goes beyond letting multiple languages share existing class libraries. SOM libraries written in one language can be subclassed, or modified, by users of a different language. The system supports a single line of inheritance as well as run-time dynamic binding of objects. It will also make object libraries work with languages that are not object-oriented, such as C.

IBM will include SOM in a future release of its AIX operating system and possibly in the joint development work it is doing with Apple under the Taligent banner. Apple's Pink operating system, which will serve as the basis of Taligent's work, is not based on SOM. However, SOM may be used to tie other languages into the Taligent system.

Although developers are making plans to market OS/2 2.0 programming

tools and applications, they have not yet made any commitments to SOM because IBM has only just started promoting it.

OPTi chips

By early 1992, a new generation of PCs could emerge that offer Windows users as much as a fivefold performance improvement, thanks to a new chip set from OPTi. OPTi's new local bus chip set will let Windows and peripherals run at the speed of the CPU rather than at the speed of the standard 8MHz AT bus. A 40MHz 386-based PC is expected to experience a fivefold increase as the AT bus ceases to be a bottleneck for running graphics applications.

Bell Computer Systems is one of the first to use the chipset in an upcoming range of 386 and 486 models due imminently. Although pricing has yet to be decided, the chipset could reduce list prices by as much as 30% compared with conventional AT bus PCs.

OPTi's local bus chipset offers users a number of other benefits. Because of the design, more than one PC maker could offer upgrade modules that would work in your computer. Currently, upgrade modules are largely proprietary in that users can get them only from their original vendor. The local bus technology will also reduce the need for upgrade components, dropping the cost of upgrade modules by as much as 60%.

The OPTi chip set features 486 dynamic RAM burst support, an optional write-back cache controller with a cache ranging in size from 64K to 512K, and support for as much as 64Mb of local memory.

Multimedia happenings

Two chip makers, C-Cube Microsystems and Chips & Technologies, are collaborating to bring fast video to desktops without the customary high price tag. The companies last week announced joint production of a developers' kit for full-motion JPEG (Joint Photographic Experts Group) video. The kit will include C-Cube's CL550 JPEG compression processor and Chips' PC video digitiser, and is designed to make it easier and less expensive for OEMs to deliver video systems to end-users, the companies said.

User can expect to see boards based on the kits (with audio added) selling for less than £1,000 by the end of 1992, according to C-Cube.

Users can input analogue video, convert it to digital, and compress it so that it can be stored on a hard disk. Video can be captured and replayed in real time, defined at 30 frames per second,

in a 320x240 window on systems equipped with at least a 286 processor. Using a process known as pixel replication, the system can then replay video in real-time in a 640x480 window.

Even without the kit, OEMs were able to combine the two chips on their own. VideoLogic was planning to ship its £2000 MediaStation for the ISA bus in February. However, the developers' kit includes a reference design for use as an example for the PC's ISA bus, which should ease the development for OEMs, reduce costs, and help popularise the combination.

JPEG is a compression method that drops out redundant information in individual frames. Other methods, such as the as-yet-unfinished MPEG standard, promise to provide higher compression. However, JPEG preserves good image quality and is frame accurate, so it's suitable for video editing.

MPEG will only compress certain reference frames from a video sequence, while JPEG is designed to compress each frame. JPEG is also symmetric, which means it can compress and decompress at the same ratios, resolutions, and speeds.

The chips are designed for use with any bus architecture, including the NuBus found on some Macs. The JPEG Video Development Kit will be available from both C-Cube and Chips for around £3000.

DOS 5.0 on ROM

Microsoft is preparing to release a ROM version of DOS 5.0 to portable PC OEMs. DOS 5.0a is the first version of DOS 5.0 that can be built into the ROM chips of portable computers. It also includes at least one bug-fix for DOS 5.0. These fixes are available on CompuServe and will eventually be incorporated into the general purpose DOS 5.0.

DOS 5.0a also includes versions of the DOS utilities that are modified to work with hardware such as static RAM cards that can be installed in portables. The ROM version of DOS 5.0 will offer easy upgradability for hardware vendors who will just send out a new ROM to customers to put in their motherboard.

DOS 5.0a will not include the Advanced Power Management (APM) specification that Microsoft designed with Intel and Phoenix Technologies. APM is designed to inform the computer when hardware components are not being used. This capability allows the unused components to be shut down, and it warns applications and drivers if a power shut-off is imminent.

APM will be included in Windows 3.1, as will as a later release of DOS 5.0.



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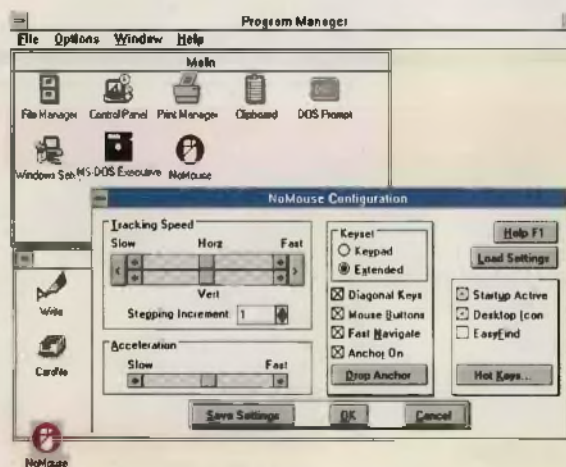
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Faster than a speeding bullet

Now that similar software appears on both the Mac and Windows environments, performance comparisons would be useful. Mick O'Neil presents the results of an independent study, and attends 'The Ms DOS Beauty Contest', which was a drag.

Microsoft has now shipped well over 7 million copies of Windows 3.0 and despite significant drawbacks that I've noted in this column, Windows provides the established alternative graphical user interface. A few of the major software developers anticipated the success of Windows and ported Macintosh applications to that environment.



△ Ball & Stick lets you accurately create complex molecular structures like myoglobin, above

Just some of these include Word, Excel, PageMaker, PowerPoint, Wingz, Persuasion and Illustrator. Even Claris, Apple's software subsidiary, has moved into the Windows market with the purchase of Hollywood, a Windows-based desktop presentation program. Claris has also announced a future release of FileMaker for Windows.

For years Mac users have been exhorting their PC colleagues to recognise the advantages of Mac software. Of course, insecure data processing types who spent much of their work experience and education wedded to the va-

garies of CONFIG.SYS and ALT-F3 responded by attacking the speed of the graphics-intensive Macintosh operating system. And initially, they were right. The Mac 128 was a tortoise. PC users inwardly smiled as they watched these GUI extremists go through the old floppy shuffle while trying to keep the system, an application, and data on two 400K floppy drives. But all that has changed. In eight years Macintosh hardware and software has matured. Now that similar software appears on both platforms, performance comparisons make some sense.

Ingram Laboratories, one of the most reputable computer testing facilities in the United States, is not committed to any one technology. The company's clients include AST, Epson, NEC, Hewlett-Packard, Intel, IBM and Apple. Thus, Ingram Labs is ideally positioned to conduct an objective personal computer performance study.

Comparison tests

In the autumn of 1991, Ingram published 'A Performance Comparison: Macintosh vs Windows PCs'. The company's technicians designed a series of benchmark tests to simulate real usage of Mac and Windows 3.0 applications. Typical timings included opening a file, scrolling, running a macro, performing calculations, and printing. Applications tested included all the major cross-platform programs mentioned earlier.

The results will not surprise Macintosh users but may startle the Windows

world. The Quadra 700 and 900 outperformed every computer tested including a system based on the Intel 486 processor running at 50MHz. The Classic II was the fastest machine priced under £1700 and was over 40% faster than the fastest 16MHz 386SX-based system. The PowerBook 170 and 140 were the fastest notebook computers tested and the PowerBook 100 outperformed every notebook except one — a 386SX-based system costing approximately twice the price. The Iliac blew every 486-based system away and the Iliac outperformed every 386-based computer in the tests. The LC was faster than every 386SX-based system except one and the Classic I was competitive with 12MHz 286 systems costing twice its price.

These were not sleazeball clones the Macs were up against. PC systems tested included desktop computers from Compaq, IBM, AST, Dell and Acer, and notebooks tested included computers from Compaq, AST, IBM and Toshiba.

Apple is somewhat proud of the results. Clearly, the Mac sets the standard for system speed. But the company is quick to point out that speed is just one of many important factors to be considered in purchasing a system. Other Macintosh advantages include consistency across applications, a full-featured and instinctive GUI, a greater variety of available applications, built-in networking, SCSI plug-in-and-go hardware expansion, and compatibility across systems.

Compatibility assured

I recently attended an educational workshop in Germany and one of the major topics was PC/Mac compatibility. One of the sillier sideshows featured volunteers dressing in drag to compete as

systems in the 'Ms DOS Beauty Contest'. Each contestant had to strut onto the stage and convince the audience in just a few sentences why they should be selected as Ms DOS. Ms Zenith 486 bragged about her fast processor and Ms SuperSport boasted about her sleek body and fast access. Ms Apple brought the house down when she pranced on stage and gave Ms Zenith 486 a big kiss and exclaimed 'We're compatible!'.

Compatibility is not a joke, of course. There are probably more purchasing decisions based on compatibility than on any other factor. This very often translates into lowest common denominator decision-making and explains to an extent why Apple has not garnered a larger market share in the corporate community.

There is, however, a software solution on the Mac that virtually assures compatibility. SoftAT from Insignia Solutions lets a Mac user run the vast majority of PC software in a window on the Mac and share files via software-based PC drives, the Macintosh superdrive, or a shared hard-disk folder.

Sneaking in the back door

I've mentioned SoftPC to some of my MSDOS-based colleagues and it inevitably raises a snigger. You see, they assume that every position I take is aimed at sneaking Macs in through the back door and so they dismiss SoftPC as a Trojan Horse. I would not have originally argued this point because that's exactly how I pictured the program. However, after using the software for a while, I've concluded that SoftPC is much more than a Trojan Macintosh. I did some benchmarks, testing SoftAT against 386 and 286 systems, and they bear out my subjective judgement that SoftAT is fairly competitive with 80286-based systems.

I have worked with SoftAT for some time and have discovered no incompatibilities with regular PC software. The newest version provides drivers for printing on a PostScript laser printer or an Epson-compatible dot matrix, supports EGA graphics and allows you to access a CD-ROM. The flexibility to install two software-based hard disks and access any mounted Macintosh drives means that passing information between the Mac and PC formats is straightforward. SoftAT works under System 7's MultiFinder, allowing the user to work side by side in PC and Mac environments, and supports data transfer via the scrapbook and clipboard.

Insignia Solutions continues to be one of the most successful UK software developers for the Macintosh. The com-

pany's latest incarnations of SoftPC include a suite of programs with codenames 'GoldiLocks' and 'The Three Bears'. The Three Bears are Papa Bear or SoftAT targeted at the high end, Moma Bear or Universal SoftPC available for all Macintosh systems, and Baby Bear or Entry Level SoftPC aimed at Classic and LC users.

Goldilocks represents a new product called SoftNode that connects SoftPC running on a Mac to a PC Novell network.

ThoughtPattern

I'm still waiting for the personal organiser program that personally organises me or the cheque book program that balances my accounts. My experience is that software seldom transforms the user. If you are the organised type, then a program like Focal Point with its calendars, appointment books, expense reports and so on will be an effective tool. If you painstakingly balance your cheques every month, Quicken may save you hours.

There are organised people who are abysmal failures and there are apparently disorganised people who somehow succeed. The latter deal with information in irregular chunks but discover logical threads of information through the chaos and act on them. This kind of information processing defies the rigidity of standard databases as attempts to squash the information chunks into formatted fields inevitably interfere with the process.

ThoughtPattern from BananaFish Software is the first information management software designed to handle large amounts of diverse information. It includes no pre-structured formats. You can keep notes, rolodex-type information, file management, and project management files all in one place and you dictate the way you enter and retrieve information.

ThoughtPattern items are pieces of information in the form of text notes (32,000 characters) or linked files. Tabs are text words or phrases of up to 255 characters that can be assigned in an unlimited number to an item or a group of items.

For example, I use a ThoughtPattern file with address files from Address Book Plus, correspondence and fax notes, to-do lists, and columns or articles I'm currently writing. Designating 'Computers Unlimited' as a tab will



△ First you're a mayor (SimCity) and then God (SimEarth), and now a lowly ant (SimAnt). An ant's life is more fun...

allow me to select all those items that include that tab or key phrase. Boolean operators let you select multiple tabs or key phrases to narrow your search, thus choosing 'Computers Unlimited' and 'Software' will result in a subset of the records found previously.

Once defined, tabs can be automatically assigned as items are entered or subsequently assigned using the CrossIndex feature. You can also search and select a group of records based on a text search and batch assign a tab to that group.

The tabs act as tools to 'filter' the database. Other factors that can be used to search and retrieve specific items are date, priority, tab characteristics, and resident words or phrases. For a complex file, managing tabs can become cumbersome and so the program lets you create tab groups as a means to categorise and manage lists of tabs.

ThoughtPattern lets you attach alarms to items as reminders, displays a monthly calendar up to the year 2000, and lets you set recurring alarms on a daily, weekly, or monthly basis. The alarm does not interrupt the Finder but rather is triggered when you open or are running ThoughtPattern.

ThoughtPattern 1.2 is System 7 compatible and supports TrueType fonts, balloon help and Apple events. It has earned its place on my desktop. It's already saved me time and effort and fits in nicely with my other writing tools.

Technology and education

Interested in how computers are used in education around the world? The Ninth International Conference on Technology and Education will be held in Paris on 16-20 March. Over 500 papers will be presented by educators from all over the world (including Russia). I'll be doing a presentation entitled 'The New Word

Processors: Changing the Way We Write', which will emphasise the impact of features like outliners, macros, table generators, sonic sidebars, style editors, and text retrieval systems on writing and on teaching writing.

SimAnt

The simulation of the month is SimAnt from Maxis, the publisher of SimCity and SimEarth. This time, instead of an omnipotent mayor or god, you play the role of a lowly ant. Your mission is to lead your colony to conquer a suburban residence by taking over the backyard and driving the resident human out of his house. You directly control one ant and supervise up to 1500 worker and soldier ants. Responsibilities include gathering food, digging tunnels, caring for eggs, overcoming rival red ants, fighting off hungry spiders and ant lions, and deftly avoiding natural disasters like rain and the human's lawn mower.

Like SimCity and SimEarth, SimAnt offers superb animation, colour and sound. Still, the charm of the program has more to do with the combination of simulated environmental controls, infinite variety of strategies, and supportive user interface. The latter includes a series of Hypercard-like information windows that provide background information on ant behaviour along with hints on how to play. SimAnt can be played purely for fun or used in the classroom to stimulate interest in insects and ecosystems.

My one criticism of the software is that success comes fairly easily. On the other hand, there are a lot more ants

around than humans and so maybe the program reflects reality. Interestingly, the human finally must resort to insecticide to stop the invasion!

Ball & Stick

You would be excused for guessing that Ball & Stick is a cricket or baseball simulation program. (In fact, for most users, it makes cricket look frighteningly exciting.) For a chemical engineer, teacher or scientist however, this program could save hours of tedium.

Ball & Stick is a three-dimensional molecular graphics and modelling program that provides for visualisation of models obtained from database searches, model calculations, or experimental inquiry. Models can be built from predefined library fragments, user-defined fragments or atom by atom, and the user can control bond lengths, bond angles and dihedral angles. Three-dimensional graphics can be saved or exported in standard PICT format for processing on dot matrix colour printers, laser printers, or phototypesetting machines.

The five basic model types include wire frame, Ball and Stick, SimpleSpace Filling, Space Filling, and Dotted Spheres, and you can manipulate models atom by atom or combine complex fragments. A control window can be invoked to display information on the relative positions of the first four selected atoms in the front window. Molecular models can be rotated in real time with the mouse or more exactly through corresponding dialog boxes, and rotations can be animated and saved as a standard PICS animation file for

later use in SuperCard or MacroMind Director.

The fact that I could create some pretty sophisticated molecules after being away from academic chemistry for some 20 years demonstrates how easy this program is to learn and use. The documentation is fairly thorough and includes a brief tutorial. It might be helpful in future versions of the program to include a data disk with a library of standard molecules.

Details

SoftAnt

Price: £299

Hardware required

68030-based system with minimum of 2Mb RAM

Universal SoftPC

Price: £199

Hardware required

Any Mac — emulates an 8088

Entry Level SoftPC

Price: £129

Hardware required

Macintosh Classic or LC
Insignia Solutions Ltd
Carrington House
Oxford Road
High Wycombe
Bucks HP11 2EG
Tel (0494) 459426

ThoughtPattern Version 1.2

Price: \$149.95

BananaFish Software
730 Central Avenue
San Francisco, CA 94117
USA
Tel: 0101-415 929 8135
Fax: 0101-415 929 8146

9th International Conference on Technology and Education

Paris, France
16-20 March 1991
Contact: Cheri Chase
Conference Coordinator
The University of Texas at Austin
PO Box AA
Austin, Texas 78713, USA
Tel: 0101-512 471 4080

SimAnt

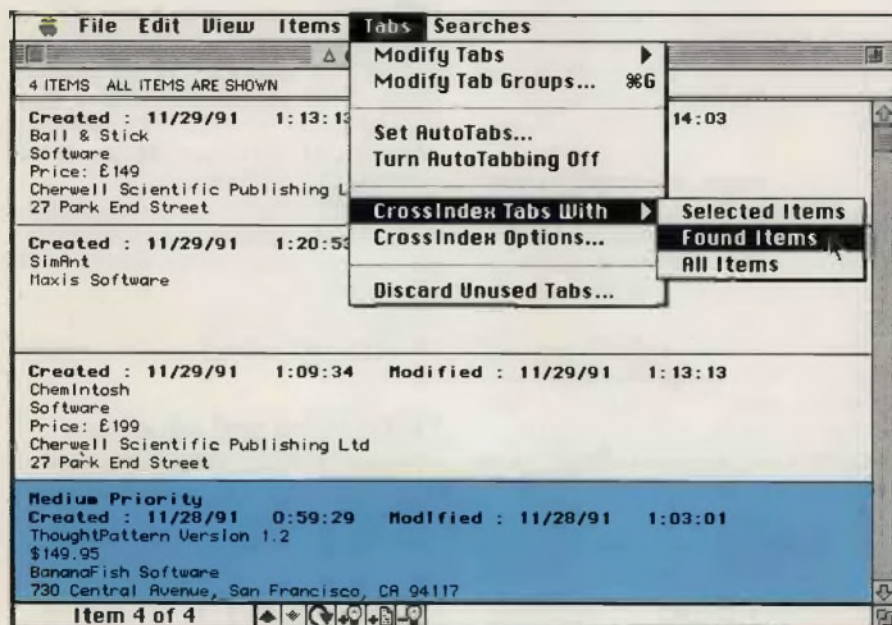
Price: \$59.95

Maxis
2 Theatre Square
Suite 230, Orinda, CA
94563-3346, USA
Tel: 0101-510 254 9700
Fax: 0101-510 253 3736

Ball & Stick

Price: £149

Cherwell Scientific Publishing Ltd
27 Park End Street
Oxford OX1 1HU
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△ The cross-indexing feature of ThoughtPattern enables you to load your database freeform and think about relationships between records at a later date

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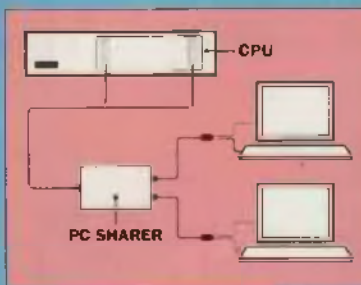
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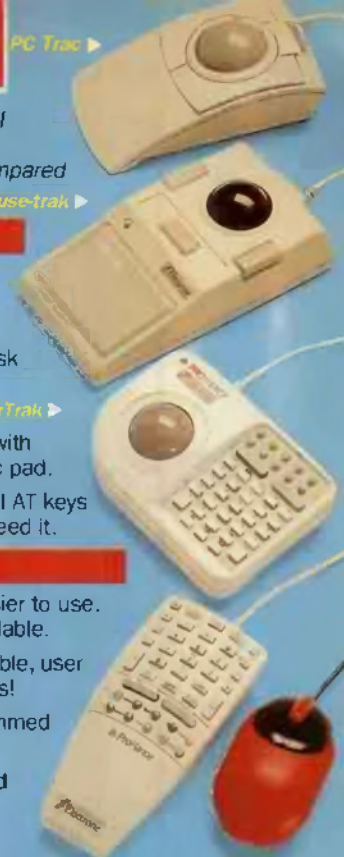
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RiscIX revisited

The R260, with an ARM3 processor and 8Mb of memory, is Acorn's replacement for the R140. Its expansion potential is limited, and it's pricey. The company will have to try harder to compete with the cheaper, faster workstations around, says DJ Walker-Morgan.

Regular readers of this column with a good memory may remember my look at Acorn's first Unix machines, the R140 and A680. Both were based around the ARM processor. The R140 was directly built from a souped-up Archimedes, the A680 was a specially designed box for developers. The only one that made it to the general public was the R140, and fast it wasn't: lumbered with only 4Mb of memory, it dragged along. Acorn later released the R260 to replace the R140, with a faster ARM3 processor and 8Mb of memory.

That was a year ago; and with Acorn having a year's development under its belt, I thought I'd revisit the R140 to see where it's going, and put it in the context of the cheaper workstations that have appeared since then.

The R260 looks the same as the older Archimedes machines, with that rather odd case with the angled block at the front holding the disk drive. Around the back are an assortment of connectors, for video through BNC connectors or through a D-type connector, SCSI (with the older Centronics connector), Ethernet, headphones (for sound) and, in the case of the machine I borrowed from Acorn, an Econet port which looks as though it is normally taped over.

Booting up into Unix

Booting up the machine for the first time, it goes into RiscOS, Acorn's own operating system. Acorn has recognised that people may want to boot up straight into the Unix side of things and has now put in a mechanism to skip straight into RiscIX. (Note that the RiscOS program which starts RiscIX contains useful options for checking RiscIX disks without booting RiscIX itself — useful for recovering the machine.) Acorn has unfortunately not disabled the reset key on the back of the keyboard — a

major liability, in my opinion. Other workstations (for that is what the R260 aspires to be) have keyboard resets or interrupt key combinations, but none so easily accessible or so apparently impossible to turn off. It was like this on the R140, and I'm sure enough people told Acorn that this just didn't help the credibility of a serious machine.

I got the R260 into RiscIX, and the

"Acorn has recognised that people may want to boot up straight into the Unix side of things and has now put in a mechanism to skip straight into RiscIX. It has unfortunately not disabled the reset key on the back of the keyboard — a major liability, in my opinion"

first pleasant surprise was that thanks to the faster ARM3 processor and twice the R140's memory, the supplied X Window system is actually usable. On the R140, X was not quite up to scratch. It really wasn't worth booting up, as it swamped the machine.

Acorn has obviously put a lot of work into the R260: it's an X11R4 server with a number of screen resolutions, 800 x 600 with 16 colours, 640 x 480 with 256 colours. You can have a number of screens open and switch between them using Xswitcher, which appears on every screen as a two-direction arrowhead.

A niggle is that even with a jolly nice multisync monitor like the Eizo 9060S, you have to fiddle with the horizontal position control when you switch between 640x480 and 800x600. You find yourself having to do this switch quite often, too. I was set up with two 800x600 screens and one 640x480 screen, for viewing pictures and trying out the colour. When I asked about this, I was told that for most Acorn users switching between modes builds in this reflex to reach for the horizontal position control on the monitor. It's a real irritation though.

X marks the spot

Getting to the X was a bit tricky. The documentation supplied tells you how to start X and then log in as a user guest with no password. Unfortunately, the program that administers logging in under X, called xdm, doesn't seem to take null passwords in the Acorn version. The real version from the X11R4 source tape does take null passwords. It's an irritating inconsistency more than anything, but I can see it confusing new users meeting Unix in its RiscIX guise.

Apart from this inconsistency, the documentation wasn't bad. Reasonably clear and covering the essentials of looking after a Unix box, it does the job of being a basic guide pretty well. Acorn has recognised, like a number of manufacturers, that a few feet of documentation is not just intimidating to users, it's expensive, and so has cut down the manual to an actual user's guide rather than a complete developer's guide. That documentation is available but doesn't come as standard.

This trend of reducing 'in the box' documentation is going to spread. The moral? If you are buying a machine for software development, don't assume

you'll get developers documentation: check before you buy.

Once logged in, I found a relatively workable X implementation. X.Desktop/2 from IXI is still shipped with the machine, along with lots of X utilities and a rather handy preconfigured version of Xsm, X Session Manager. Acorn has also been busy writing its own utilities, like a control panel for setting things like screen saver times, keyboard clicking and fonts.

Cry of joy

Also installed are an assortment of well known utilities. There was a cry of joy as Joe Evnull (an R140 user of old) found Emacs (the well known, powerful and rather huge editor). He promptly closed all the other windows and started using that instead of anything else. Why do Emacs users do that, I pondered. At least the R260 can support X and Emacs at the same time without grinding to a halt.

I found a picture viewer on the R260 and discovered that although the machine appears colourful, there is quite a *caveat emptor* on using the colours. The Archimedes hardware only supports a fixed palette of 256 colours. It's a reasonably well distributed palette, but that doesn't make up for the fact that it's fixed. Compare this to, say, a typical Sun frame buffer (the workstation name for a stupid video card with no accelerator hardware) which also has a 256-colour palette but can have those 256 colours out of a palette of 16 million. By dynamically allocating colours as they are needed, very realistic images can be displayed on screen.

True, you lose this flexibility when you run out of colours to allocate, but it's a better arrangement than a fixed palette which gives pictures with a concentration of, say, lots of shades of red or white a terribly gross appearance, as if they had been badly coloured in. Even the page in the manual for the X server refers to it as 'very unusual'.

As there isn't a colour/graphics upgrade path available for the R260, I have to say that it is not good at image manipulation on screen, where any level of realistic representation is required. Don't go by the images that come with the machine; there are a couple of pictures of landscapes and houses which have been chosen more to match the limitations of the display. They have a wide distribution of colours which match the palette well enough not to look odd. Check it out with other images, if you don't believe me.

The implementation of RiscIX itself



is good, in the face of the hardware limitations. The hard drive supplied is only 120Mb, and yet the software chaps at Acorn have managed to pack it with a well-rounded Unix. It's firmly descended from BSD Unix, but with a lot of inspiration taken from other BSD systems. It has some of the System V commands which are almost mandatory on BSD Unix derivatives these days, and the hierarchy of files and directories is arranged in a way reminiscent of SunOS. NFS and NIS (Network File System and Network Information Services), the de facto standards for plugging into a Unix network, are included.

For fuddy-duddies

Also included is the good old BSD Fortran compiler, for old fuddy-duddies, and for new fuddy-duddies there is Acorn's ANSI C compiler. There is an interesting inconsistency in the development tools; although the C compiler is a relatively up-to-date ANSI compiler, things like the Make command and debugger seem not to have caught up and still seem to be relatively old versions.

I sat down and compiled up some of my favourite X programs, and unlike the R140, I was most pleased to find that they went through relatively painlessly. I got the Xv, Cbzone and Xbench up and running. Xv, the image viewer, worked well enough, within the limitations of the display. Cbzone, the tank game which I find is good at thrashing out machines with bad compute and display performance, ran reasonably

well but opened a window which was too big for the screen. Compared to a 386 box it ran smoothly, but compared to a typical SPARC box it was a bit jumpy.

Benchmarks

To give myself a rough benchmark I ran Xbench, which can produce an Xstones figure. Xstones is yet another benchmark, possessing all the usual faults of benchmarking programs, so no reading as gospel or dashing out to buy the 'fastest' machine purely on a benchmark figure. I use benchmarks after playing with the machine to see if I can guess what they'll score. If much lower than my guess or higher, there's cause for investigation.

In the case of the R260, you can get a number of different Xstone ratings. Running the Xserver with three screens, in 800 x 600 with 16 colours, I got around 18,000 Xstones, a reasonable rate. Going to 640 x 480 with 256 colours, the Xstones figure dropped to around 11,000. This is still much better than the old R140, which clocked in with only 10,000 Xstones with a monochrome display. For a more contemporary comparison, a 25MHz SPARC-based machine with 'straight from the MIT tape' X11R4 clocks in 20,000 Xstones, with 1152 by 900 in 256 colours. At least you can lose colours to pick up performance on the R260, but with the price range the machine is in, you can get better performance elsewhere.

The problem for the R260 is one shared by many of the 'upgraded to Unix' boxes out there. Like the Com-

AT&T 3b1

A visit to Private Eye prompts Jon Tyler to wonder whatever happened to Olivetti's AT&T-badged 3b1.

If I were to say that the best computer I've ever seen was a 6MHz 68000 with a hard disk running slower than the average floppy, you'd think I'd flipped. But it all depends on whose definition of *best* you use; the system I'm talking about is an AT&T 3b1, an ancient Unix PC which is actually made by Olivetti and which never caught the attention of the press or the public.

I saw one of these for the first time recently when visiting the offices of *Private Eye* to help someone get on-line to the Usenet news network. I was impressed by the amount of work that had been put into the 3b1's applications program to make it user-friendly — and for once the description seemed appropriate. The machine shows the user an 'Office' model of the system and hides Unix underneath. It has a windowed front end (through text windows rather than graphically represented ones) and a keyboard with lots of function-specific keys. When stuck, I would try the Help key and it usually did.

The office model is slightly more general than the traditional 'desktop' metaphor. For instance, there is an

'Administrator's office' for traditional sys/admin jobs like package installation and password setting.

One of the nicest packages the 3b1 has is a phone book; you can safely assume that AT&T knows all about phones! This works with a good built-in AT&T modem — nothing fancy, just 1200 bps, but it is solid and reliable and it always works. As well as just storing names and numbers it will dial them too. As soon as the number has been dialled it cuts the modem out of the circuit and lets you talk to the person directly.

Terminal session

You can put bulletin board numbers in your phone book, and as soon as you have called them the telephone manager will start up a terminal session for you. You don't have to know anything about comms commands, such as the dreaded 'cu': just point and click. I say click because there is a mouse, but as all the applications are written it is somewhat redundant.

It has to be said that all the 3b1's programs ran embarrassingly slowly. But nevertheless it is the first Unix system I ever saw which I felt happy to give to a non-technical user, actually expecting to see an increase

in their productivity.

I would like to know why the 3b1 flopped; it was slow, yes, but the people using it wouldn't know that. Perhaps the answer lies with poor marketing, but that is strange too because the software is so well integrated it looks as though someone in market research knew what they were doing for once. Perhaps it was just too expensive, but these machines could be had for a couple of hundred dollars each.

You know what I think? The Unix underneath was so well hidden that the machine was unsupportable by standard Unix hackers; much the same way as many hackers won't touch the Mac because they can't find the command line.

As an X-Windows user, I found the extended desktop metaphor of the Unix PC quite natural; a friend who is a Unix guru doesn't use desktops and threw up his hands in horror when trying to work out just which programs were running: the integration is so seamless that the system underneath is invisible.

If you ever get a chance to see one of these machines in action, take it. You'll learn a lot about user interfaces and the true meaning of user-friendly.

modore Amiga 3000UX, the cost of the machine is high, comparable to many of the 'aUnix' workstations like the Sun SPARC machines and compatibles, NeXT, and the low-end DEC machines. It is also in the price range of a well-configured 386 or 486 box running Unix. Even though they are based on an existing machine, these 'upgraded to Unix' boxes tend to cut off compatibility with any previous software for the native operating system (like Workbench on the Amiga and RiscOS on the Acorn machines) from within Unix. With this compatibility path gone, the unique selling point of the machine is eliminated and you have to regard it purely on what it can do under Unix.

The only notable exceptions to this rule to date are DOS emulations under Unix on 386 machines, and Apple's work on A/UX which made an earnest attempt to have the Mac operating system alongside a running Unix system, as transparently as possible.

Pushing and packing

The R260 doesn't have this ability, apart from commands for reading and writing RiscOS disks. RiscIX seems a decent enough environment, and praise must be given to the people who did the implementation for pushing the hard-

ware to its limits, and packing in so much in so little space. Compared to Commodore's System V Release 4 on the A3000UX, it's a masterpiece of matching Unix and X to a machine.

Alas, it is the hardware that limits the R260. The maximum memory size is 16Mb of RAM, very small these days. There seems to be little on the horizon from Acorn in terms of other ARM-based machines with more memory and speed; the A5000 can go to 8Mb with modifications, but it does run a bit faster. If Acorn were to release a new machine for RiscIX to run on, it would have to be much more expandable in terms of memory; 32Mb to 64Mb would suit me. It would have to be faster, to match up to nippier workstations in the same price range, and it would have to have a much higher resolution screen, above 1024x768 and with at least 256 colours at that resolution. Finally, it would need a bigger standard hard disk.

Aggressive market

With that kind of specification, and the RiscIX programmers freed up to develop the user environment and development tools, you would have a good little machine which would stand a chance in what is one of the most aggressive seller's markets in comput-

ing today. If I were Acorn right now, I'd be releasing a larger memory A5000 with a RiscIX upgrade at a lower price. Without the backwards compatibility card to play, the price/performance ratio must be made much higher.

As it stands, unless you can get the price down and you have already invested in an ARM-based machine — an educational establishment with existing Archimedes machines, for example — I can't see any justification for buying an R260.

Acorn is on (0223) 245200.

DJ Walker-Morgan is a Unix and X software developer. You can contact him as dj@micromuse.co.uk, or as dj@cix.

Prices

The Acorn R260, with 8Mb of memory, 120Mb hard disk, Ethernet, RiscIX installed, one year's on-site maintenance, but excluding a monitor (you'll need a decent SuperVGA-compatible monitor) costs £3825. Extra memory comes in 4Mb amounts, at £399 per 4Mb. The Acorn R225 is a R260 without a hard disk and costs £1987, though how a 120Mb SCSI hard disk can cost nearly £2000 is beyond me. All these prices exclude VAT.

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Net curtains on Windows

Microsoft's hypersuccessful graphic interface can bring your network crashing down if you don't watch your step during installation. Ralph Bancroft tells how it should be done.

With Windows applications now so prevalent (Microsoft estimates that by the end of 1991, Windows applications were outselling character-based DOS ones) many people are installing Windows on their network workstations. This should be straightforward, but as my problem log shows it has now risen to the top of the league of most common complaints. So this month's column looks at how to go about installing Windows on a network and how to work around some of the pitfalls.

Halfhearted attempt

The first thing to understand about Windows, as I have mentioned before, is that it is network-aware but not network literate. That is, it recognises that networks exist and makes a halfhearted attempt to do something about it. Unfortunately, a straight-out-of-the-box installation on a network workstation will probably result in a machine that crashes, hangs or (best of the lot) reboots itself every time you try to run Windows. And even if you can get Windows to run, you may find that it runs slowly or your Windows applications cannot print or garbage emerges from the network print queue.

The cause of these and many other Windows ailments is that being a Microsoft product, it doesn't abide by the company's own recommendations to software developers to write clean code. It uses undocumented system calls and does some decidedly nasty things with memory, resulting in conflicts even on a standalone PC.

So how do you avoid the pitfalls of running Windows on a network? For a start, you plan what you are going to do and the order you are going to do it in.

First, you need to undertake an audit of all the workstations on the network, noting down processor type, display

adaptor type, kind of monitor (mono or colour), amount of memory installed, size of hard disk (and amount of free space) and, finally, whether a mouse is installed and, if so, which kind. At the same time, you should also check what versions of the workstation network software is installed on each machine, and also what the hardware settings are on the network adaptor.

This can be a time-consuming exercise but could save you a lot of time (and grief) later. It is also a good practice. Large organisations with full-time help desks maintain an inventory of all the hardware and software on their networks, so when a user rings up they can quickly identify how the problem machine is configured and so speed resolution. Your preparatory audit for installing Windows will give you a similar inventory that can be maintained on a continuing basis as machines on the network are upgraded, replaced or reconfigured.

Identifying upgrades

But the principal reason for the exercise is to identify for each machine on the network what hardware and software upgrades will be required to run Windows. This is often not a trivial matter. A 10MHz 286 with 640K of memory and a monochrome screen may have been more than adequate for running your character-based applications but Windows is much more demanding. At the risk of starting a debate in the letters column, my minimum specification for a Windows workstation on a network is a 20MHz 386SX with 4Mb of memory, a 40Mb hard disk, colour VGA screen and a mouse.

It soon becomes obvious that there is a heavy cost involved in upgrading PCs to run on Windows. You can cut corners. For example, Windows will run

with 2Mb of memory providing you have only one or possibly two applications active at a time. This sounds fine to a DOS user, who may only ever have one application running at a time, but as Windows users will soon tell you, Windows is a multi-tasking environment and once you have got used to switching between active applications you won't want to go back to one-at-a-time. Moreover, Windows will run noticeably faster with 4Mb than 2Mb.

Retirement scheme

Rather than upgrading your existing machines a more cost effective approach might be to retire some of your old machines. If they are over three years old, the chances are that they have already been written off for accounting purposes, and if you just look through the pages of PCW you will soon see that a brand new machine with the specification I have outlined can be a very affordable proposition (especially when many vendors bundle DOS 5.0 and a copy of Windows in the purchase price).

The other hardware issue you will need to address is that of the network adaptor: the driver that came with the card may not be happy with Windows. A case in point is the Western Digital Ethercard Plus running with NetWare. So you may have to seek out an up to date driver. Also, Windows is very iffy about INT2 conflicts, particularly when running in Enhanced mode. If any of your network adaptors is configured to use INT2 it will need to be reconfigured to use a different interrupt setting.

If your network is more than a year old, you will probably have to upgrade some of your software. The NETWORKS.TXT file that comes with Windows gives an introduction to the problems and limitations when run-

ning on different networks.

The network that involves the most work is Novell NetWare. For starters, you need to be running NetWare 2.10 or later. If you have installed or upgraded to NetWare 2.2 or 3.11 life is simpler. If not, Windows requires that the workstation shell components (IPX.COM and NETX.COM) are version 3.01 or later. The most recent versions are 3.22 and you are strongly recommended to upgrade to these. You can get the latest shells from your Novell dealer.

Novell has now dropped the idea of DOS version specific workstation shells and the new shell, literally NETX.COM, automatically configures itself for the version of DOS running on the workstation. The other change that came in with version 3.01 is a version of the shell that can be loaded into expanded memory (EMSNETX.EXE) or extended memory (XMSNET.EXE). These could be a boon if your workstations run memory-hungry applications.

An alternative to getting the new shells from your dealer is to download them from Novell's NetWare support conferences on CIX or Compuserve. The most recent files can be found in the file DOSUP3.ZIP (as at the time of writing, double check before downloading).

If you upgrade the workstation software you will also have to upgrade the BINDFIX.EXE and MAKEUSER.EXE utilities (again, NetWare 2.2 and 3.11 networks have the correct versions). These come on a disk called NetWare Workstation for Windows. You should be able to obtain a copy from your Novell dealer or the disk can be downloaded from CIX or Compuserve. Also on the disk are some patches for Windows, NetWare Tools (a collection of Windows utilities) and some Dynamic Link Library (.DLL) files that are used by Windows applications written specifically for NetWare (a good case in point is NetMagic, which featured in November's 'Networks' column).

Install options

Before settling the hardware and software upgrade requirements you have to decide on how you want to install Windows. There are basically three options:

- Each user can run Windows entirely off the local hard disk. This gives better performance, minimises network traffic and allows the maximum flexibility for a personalised configuration. The downside is that the network administrator or supervisor loses control over how each machine is configured (thereby increasing the support problems), and each machine will

have to be upgraded separately if you decide to move to a new version of Windows (like the shortly-to-ship Windows 3.1).

- You can split the installation between the workstation and the server. The workstation holds all the configuration and machine specific files while the system files, utilities and applications and games that come with Windows are held in a shared directory on the server. This will greatly reduce the amount of real estate that Windows takes up on the local hard disk and means that system files need to be updated only in one place. The negative impact is that network traffic is increased and performance will degrade, especially on networks running at less than 10Mbps per second. There is also a significant increase in server utilisation, which can impact performance (if



you have more than one server on the network, you can mitigate this by balancing the load between servers). A final problem here is that if the server is down, the users are down.

- Or you can put all the Windows software on the server. You will certainly have to do this for diskless workstations (that is, ones without a local hard disk). You may also want to consider this if you want a hardware-independent Windows installation for each user. The benefits of this approach are that there is minimal impact on local hard disk space (where this exists) and it is the solution that gives maximised control to the network administrator or supervisor. Like the split option in the previous paragraph, this option has the disadvantages of poor performance across the network, an overloaded server, and disruption to users when the server is down.

Working out which is the right option for you is not easy. If your network philosophy is one of strong centralised control, then you will choose one of the

two latter solutions. If network resilience is more important, then the first option will ensure that users can carry on working even when the network is down. Otherwise, performance considerations are the ones that may decide it.

Running off a local hard disk will give you best performance, particularly if it is a 386 or 486 system and you want to run in Enhanced mode. This allows you to task switch between character-based DOS applications and take advantage of the special features of 386 protected mode, like virtual memory which uses space on the hard disk to create the illusion of having more RAM in a machine than is actually there.

Swapfile problem

One issue to consider is that because of the sophisticated memory management, Enhanced mode is around 20% slower than Standard mode (that's not my figure, it comes from Microsoft). Also, to perform the miracle of virtual memory, Enhanced mode makes use of a swapfile. For maximum performance, you can create a permanent swapfile on a local hard disk. If you don't do this, Windows creates a temporary swapfile every time you run it in Enhanced mode.

The problem is that you cannot create a permanent swapfile on a network drive, so running Windows in Enhanced mode off a network drive means that a temporary swapfile has to be created every time and this can take as long as a minute to setup.

A final performance issue is that to speed disk performance Windows uses a caching driver called SMARTDRV.SYS which, like the permanent swapfile, only works with the local hard disk.

There are some hints and tips on how you can work around these performance bottlenecks when running wholly or partly off the server. If you have, say, 8Mb or more of memory in the workstation, you can allocate part of this to a RAM disk. You can then copy down some of your Windows files to the RAM disk every time you log on to the network, and as a result Windows will load a lot faster. Also, both Windows and Windows applications create temporary files and you can improve performance by using the RAM drive as the location of the directory where these files are stored (this is set in the AUTOEXEC.BAT file with the line that begins: SET TEMP =).

Another performance booster when running in Enhanced mode across the network is to use a local hard disk (where you have one) as the location of the permanent swapfile. You do this by creating the permanent swapfile dur-

ing installation and manually putting an entry into the [386Enh] section of SYSTEM.INI that reads "PagingDrive=C:".

Strict order

Once you have made your decisions on how you want to install Windows and have armed yourself with all the hardware and software required, you are ready to start the upgrade and installation process. It helps if you organise this in a strict order. It will ensure that you have a working system at the end of each stage and makes it much easier to pinpoint the cause of a problem if not.

The first stage is upgrading the server hardware and software. The two principle hardware issues are memory and disk capacity. By far the best way of boosting server performance to cope with the increased load is to put in more memory and configure this for disk cache. The disk space requirements are determined by which of the configuration options you choose to use. The one common feature is a shared Windows directory that holds all the files that come on the distribution disks. This will take up around 10Mb of disk but you should allocate more if you intend to use a lot of supplemental or third-party device drivers.

If you are running Windows entirely off the server, Windows' setup program will use around 160K of space in each user's home directory. In practice, many of the files copied by SETUP are redundant as they are device drivers that the workstation picks up from whatever boot device it uses (local hard disk, local floppy disk or boot image file on the server) so can be deleted. A more realistic figure might be 50K per user.

A more serious consideration is if you want your workstations to run in Enhanced mode off the server and don't have local hard disks that you can use for the swapfiles. In this case you have to decide to allocate a minimum of 1Mb per user for their temporary swapfile or dispense with this feature altogether (you set 'Paging=No' in the [386Enh] section of SYSTEM.INI).

The software upgrade at the server will be determined by what network operating system you use. If you are using versions of NetWare earlier than 2.2 or 3.11 you should check with your Novell dealer or download from CIX or Compuserve the two files DSWIN3.ZIP and DSWIN4.ZIP. These contain updated utilities in addition to the ones mentioned earlier.

The next stage is to upgrade the workstation hardware with the extra memory, video adaptor, mouse or whatever else you decide is required. If you

need to change the network adaptor jumpers, now is the time to do it. To check the installation you should first power up the machine as a standalone PC and satisfy yourself that it functions as you would expect it to. If not, go back and reconfigure the system to get rid of any memory or interrupt conflicts.

Next you either install the new network drivers and workstation shell or, if you are already using the latest versions, you run the network software and log on to the network. Again, test that everything works the way it should and if not go back a step and reconfigure.

You repeat this process for every workstation. You are now ready to install Windows.

The Windows documentation is rea-

"You re-boot the machine, log on to the network, switch to your Windows directory, type WIN and, voilà — welcome to the wonderful world of Windows"

sonably clear on how you go about this. First, you have to write a little batch file that decompresses the files on the distribution disks and copies them to a shared directory on the server. To avoid any sharing conflicts, use the DOS ATTRIB command to make sure that all the files are set to Read Only. Any supplemental or third-party device drivers should also be copied in to the same directory and made Read Only.

Sprained wrist

Now you can finally install Windows for each user/workstation. One way of doing it is to go round each workstation in turn and install Windows from floppy disk. Unless you want a sprained wrist, there is nothing to recommend this method. Instead, you sit at the workstation, log into the network as supervisor or admin (depending on what kind of network you are using), switch to the shared Windows directory and type SETUP /N.

You are prompted through the setup process for information like the path to the Windows directory for that user/workstation. The default is C:\WINDOWS but you can change it to N:\USERS\USERNAME where N:\USERS is the network path for the user's home directories and

USERNAME is for the person who normally uses that workstation.

SETUP automatically senses what the hardware configuration of the workstation is and also senses what network you are using. This autosensing is not foolproof but you are presented with a dialog box that allows you make changes to the configuration it thinks it is working with. Armed with this information it copies the requisite files to the nominated Windows directory and makes changes to CONFIG.SYS and AUTOEXEC.BAT.

Clearly it cannot do this if the workstation does a remote boot off the server. Instead it writes two files, CONFIG.WIN and AUTOEXEC.BAT, containing the suggested changes, into the user's home directory.

Default groups

SETUP also builds the default program groups and allows you to browse both local and network drives to set up the Windows Applications program group. A word of warning here for NetWare users. SETUP goes to the root directory of every drive and works its way down each directory and sub-directory tree. If you currently have, say, four drive mappings SETUP will search the server's entire hard disk four times if you select the 'search all drives' option. Not advisable to those who hate watching paint dry.

When SETUP finishes it asks if you want to start Windows or exit to DOS. You should choose the latter option. An over-the-network installation of Windows can do some weird things, like putting in your CONFIG.SYS a 'DEVICE=' statement that points to a device driver on a network drive. This is a little dumb, because at boot time the workstation is not logged on to the network. Some manual tidying up will be required to make sure that the drivers are copied to the right place and the Windows specific entries in CONFIG.SYS and AUTOEXEC.BAT point to the right places.

This done, you re-boot the machine, log on to the network, switch to your Windows directory, type WIN and, voilà — welcome to the wonderful world of Windows.

What's that, the system has hung or re-boots itself? Your Windows applications can't see your network printers? Stay tuned: next month, trouble shooting Windows on a network.

Ralph Bancroft is research director of networking consultancy, GCO Communications. He can be contacted on 071-895 9765 or on CIX as ralphband and Telecom Gold as JNL522.

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More prompting

Following on from 'Prompt Delivery' by Karl Dallas (Hands On 'Utilities', PCW December 1991) here is the PROMPT command I use on my PC. Each time the system returns to the DOS prompt, it shows the current date in the top left-hand corner of the screen. The only drawback is that it uses some ANSI terminal escape sequences that are available only if you have the ANSI.SYS device driver in your CONFIG.SYS. This should be no hardship, since ANSI.SYS comes free with DOS and takes up only 4.1K of memory.

```
PROMPT $e[s$e[1;65f$e[K
      $d$e[us$pg
```

If we break this sequence down:
\$e[s saves the current cursor position.
\$e[1;65f moves the cursor to line 1, column 65.
\$e[K erases to the end of the line.
\$d displays the date.
\$e[u restores the cursor position.
\$p\$g displays the normal DOS prompt.
 Note that there should be a space just before the **\$d** to ensure a blank in front of the date.

Nicholas Burkinshaw
Derby

SoftPC/ATM font clash

If Adobe Type Manager is being used, the letters on the SoftPC window can overlap each other and extra copies of the cursor will appear on screen. This is due to a font clash with the standard ATM fonts.

To get rid of the problem you can either disable ATM every time you run SoftPC, or you can remove the offending fonts which are a couple of the standard Times/Helvetica/Courier/Symbol set supplied with ATM.

A more elegant solution, if you have the memory, is to upgrade to System 7. When a TrueType font is available, System 7 will automatically use it for the screen and the printer. This makes a number of the ATM fonts redundant and removable, and eliminates the problem with SoftPC in the process.

The SoftPC fonts cause clashes with

bitmap fonts, so don't install the font suitcase in your System file unless you really need PC-text output.

Lloyd Wood
Peterborough

Toner replacement without tears

If you've run out of toner and can't face replacing it by hand, and the only printer left is the Apple ImageWriter that came with the Mac all those years ago, read on...

Serial printers for IBM-compatible PCs are nearly a forgotten art. To run one you need a cable called a null modem; nothing difficult, just a 25-way D-type plug for the printer and a 9 or 25-way D-type socket for the PC, from Tandy or somewhere similar.

The wiring needed is shown in Fig 1 below.

To run the printer under DOS, add the following two lines to your AUTOEXEC.BAT file:

```
MODE COM1:9600,N,8,1,P
MODE LPT1:=COM1:
```

The 9600,N,8,1,P bit refers to 9600 baud, no parity, 8 data bits, 1 stop bit and the P signals hardware handshaking (the PC will look for the printer to toggle pin 20 to indicate buffer full, rather than expecting the return of a control character). If your printer is configured for a different baud rate (speed) or parity, just adjust this line as necessary.

If you want to run the printer under Windows you won't find a driver for the Apple ImageWriter, but you can instead set it for the Citoh 8510 — it works a treat.

Nicholas Burkinshaw
Derby

Fun with floppies

Do you have a PC with an apparently faulty floppy drive? One which appears to find the same files on two different disks once they have been swapped over? The problem is probably down to the media change line, a signal given by some drives to tell the computer that the disk has been swapped. To save time, MSDOS may retain directory information in RAM rather than reading it from the disk each time it is used. The media change line is used to tell the computer to forget about any such information it may have cached.

Before media change lines existed, MSDOS would always re-read information from the disk because it had no way of knowing if it had changed. Later versions of DOS support media change, but upgrading the version of DOS does not upgrade the BIOS, the controller or the drives. You can end up with a system which thinks it knows when you have changed a disk, but in reality never does.

Fortunately, there is a way to get MSDOS to forget all about media change lines. When DOS is setting up the parameters for each drive, it may well assume that your floppy disks support media change. This is achieved manually using the /c switch with the DRIVER.SYS device driver. DRIVER.SYS has no such switch to suppress this function, so the way to do it is using the DRIVPARM option in CONFIG.SYS. The line

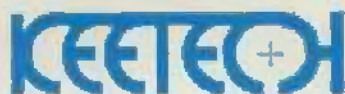
```
DRIVPARM=/d:0
```

will set the parameters of drive 0 (that is, A:) to standard (that is, without media change) by referencing them and not setting any further parameters. You can do the same for drive B: with /d:1.

Tony Capelli

Printer (25-pin plug)	PC (25-pin socket)	PC (9-pin socket)
2	3	2
3	2	3
4	4	8
5	4	7
6 and 8	20	4
7	7	5
20	6 and 8	1 and 6

Fig 1



**REAL VALUE
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LIST PRICES - CALL FOR BEST; NOTEBOOKS TOO

Complete system prices in UK£ Budget Mono and 286 also available

Type	Processor	Cache std-kb	Mono VGA		Colour SVGA	
			No HDD	42.5Mb	No HDD	42.5Mb
E4XD	386sx 25 Mhz		475	580	585	690
C5D	386dx 25 Mhz		545	650	655	760
C8D	386dx 33Mhz	64	625	730	735	840
F10D	486sx 20Mhz	8	695	800	805	910
D14D	486dx 33Mhz	64	855	960	965	1070

BUDGET COLOUR VGA - £40 OFF Colour SVGA PRICES

Standard systems include 1Mb memory, 1.44Mb floppy, 14" monitor (colour - .28/.29dp), 1Mb video RAM (colour) 256Kb (mono), 2 serial 1 parallel 1 games ports, 102 key UK keyboard, one year collect/return warranty.

Alternative disk drives

true Mb	true ms	Price
52	17	add 35
85	17	add 70
130	19	add 140

Other
mainboards
disks etc. -
please call

Extras

Item	Price
Extra 5.25" 1.2 floppy	40
per extra Mb main memory	27
Mouse	15

Operating systems etc

DOS4.01 + GWBasic	30
Microsoft mouse + Windows 3	70
DOS5 + QBasic	50

Printers, notebooks

24pin Panasonic KXP1123	145	Notebook sx20 2Mb 60Mb	1100
-------------------------	-----	------------------------	------

Please call for software and all peripherals. Delivery - £15 for systems; £10 for software.

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Fumbling around with fonts

I have Adobe Type Manager on my PC and am trying to talk to a HP LaserJet IID with the S2 cartridge (Times Roman in 8.25, 12, Helvetica in 14). I now have all the decent fonts I want, but the screen fonts do not quite match the printer fonts: that is, in Excel, all the word-wrapped text doesn't fit in the cell on the printer, but it is a tad smaller (relative to the cell) on screen. Printer fonts are selected as well as the Type Manager's 'use prebuilt fonts if available'. I am confused. What am I doing wrong?

drhys@cix

Take out the cartridge and use only software fonts, and see if the problem goes away. Do you have PRTRESFAC=0 in your WIN.INI file?

Steve Cassidy

Sign of the times

I have a sign-writing business and I understand that it is possible to use a computer for cutting letters out of vinyl. I have seen software available for doing this, but I cannot find a supplier for the actual machine.

(Name and address supplied)

Roland has a desktop machine called STiKA designed for producing vinyl stickers in a narrow strip, which may be useful. Wight Scientific may also be able to help, and Leonardo Computer Systems has a wide range of machinery available for cutting or engraving.

Roland, Rye Close, Ancells Business Park, Fleet, Hampshire GU13 8UY, (0252) 816181.

Leonardo Computer Systems, Innovation Centre, University of Reading, Reading RG6 2BX, (0734) 753477. Wight Scientific, 44 Roan Street, London SE10 9JT, 081-858 2699.

Amstrad typing

I have an Amstrad PC3086 but can only use one hand for typing. I am therefore unable to access those characters that require the Shift, Ctrl and Alt keys. Is

software available which would give me access to the full range of characters on my keyboard?

Lee Etherington
Dyfed

There are a few public domain utilities for achieving this, one being 1finger. It is available from many bulletin board systems and PD software libraries.

Ray O'Connell

Compression precautions

Sitting here with DRDOS 6 safely installed, hard disk defragged with DISKOPT, and still not enough spare space left on the hard disk, I'm wondering whether I have the nerve to compress it all using SSTOR. Is it safe? Will it work? With Windows 3.00a? What precautions should one take (apart from the obvious of backing up everything first)? I know about not attempting to compress the Windows swap file, but is there anything else those with experience can add? What does it do to comms programs and their ASCII files?

panflet@cix

I have been using SuperStor for many months now without problems — it appears to be completely transparent. It even allows disk editing software to access sectors as normal, decompressing them on the fly. The only drawback appears to be the loss of about 64K of RAM when the driver is loaded, and for this reason I would suggest leaving part of your hard disk uncompressed for applications which need the whole 640K (such as Wing Commander II).

Frank Leonhardt

Disk mirroring with DOS

It seems they don't make hard disks like they used to, from the number of blow-ups, crashes, burn-outs, and other nasties I've heard of recently. Is disk mirroring available on a standalone DOS PC? Could a dual-disk mirror be set up using a SCSI bus and some clever

software? Failing that, is there any suitable on-the-fly backup technology?

Peter Jacobs
Kent

There are two major types of mirroring. One just keeps a separate file containing another copy of the FAT with file details in case you lose that FAT. If the drive gets seriously trashed this type of mirroring will not help.

Real disk mirroring involves the use of two drives where both are written to, but only one is read from. If the read-active drive is pulled out, breaks or generates a read error, then the other drive is switched in to recover. This usually requires expensive controllers and the cost of another drive.

For real pose value, security and general smugness, a RAID is the thing. Eight drives give eight times the data transfer rate and any of them can be pulled out or adjusted with a sledgehammer without the machine noticing.

Andy Haveland

RAID has five levels. Levels 1 and 2 are at the level of simple mirroring. Level 3 calculates a checksum and writes this to one of the drives in the array (as in the Compaq SystemPro Drive Array). The really fancy stuff that people are talking about is Level 5, where a checksum is calculated and bit-stripped across all available drives.

If any drive fails, the controller is able to reconstruct the data from the remaining bits and checksum information. In other words, the array carries on functioning, albeit with some loss of performance. When the faulty drive is replaced, the controller rebuilds the contents of the drive in the background, again using the remaining bits and checksum information.

Ralph Bancroft

Dolphin contact

Where I can contact Dolphin Computer Systems, a company which makes aids for the blind?

Telephone query

Dolphin Systems, PO Box 83, Worcester WR3 8TU, (0905) 754577.

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- ☐ ATM Fonts for Windows Vol. 4 (4 d) - 30+ Additional fonts.

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- ☐ Automenu 4.7 - Latest Ver. of this popular menuing program!
- ☐ As-Easy-As-Spreadsheet program. Compatible to 1-2-3.
- ☐ Brother's Keeper 4.5 (3 d) - Fine, full-featured genealogy program.
- ☐ Dancad 3D 2.5G (5 d) - Wire-Frame drawing tool (HD).
- ☐ Extra DOS Toolbox (3 d) - Essential for the DOS user.
- ☐ Express Check (2 d) - To manage your cheque accounts!
- ☐ FormGen/FormFill (2 d) - versatile form generator and form filler.
- ☐ Grabber 3.92 - Capture text/graphics screens to COM file.
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- ☐ Mr. Label 5.2 - Powerful & versatile label maker.
- ☐ LedgerMaster (4 d). Modular/Integrated accounts/invoicing.
- ☐ PC-File 5.1 (3 d) - General database program (HD).
- ☐ PC-KeyDraw 3.76 (4 d) - Powerful drawing & design (HD).
- ☐ PC-Type 4 (4 d) - Wordprocessor. Spell, check, Mail Merge.
- ☐ Piano Man (2 d) - Create and play music.
- ☐ PKUNZIP - Tools to create/extract archives.
- ☐ Sure Fire 1.0 (3 d) - Integrated forms manager, database manager and a spreadsheet program and more.
- ☐ Vaccine and Virus Killers Ver. 80 (2 d) - Collection of utilities designed to protect your system from viruses! This disk will find (and destroy) over 200 different Viruses & 500+ virus strains.
- ☐ VgaPaint. Full colour paint package. (VGA)
- ☐ Word Right & Data Right 5.0 (4 d) - A character based, full fitted word processor and data manager.

CGA GAMES

- ☐ Adventure Game Toolkit (3 d) - To create adventure games.
- ☐ Arcade Games 1 - Pac-man Hopper, Space Invaders, Fusion
- ☐ Arcade Games 2 - 2 Double O-Bert, Breakout, Beast
- ☐ Bassboat - The ultimate fishing game.
- ☐ CGA Tetris Collection (2 d) - Ten great versions of this game.
- ☐ Chess Challenges (2 d) - 4 Good games + super Tutorial.
- ☐ Commander Keen Volume II (2 d) - Goodbye Galaxy.
- ☐ Kids' Games - Fun for the under-12 set.
- ☐ Strategy Games - Risk, Othello, Chess, Nyet and others.
- ☐ Super Schwaire (2 d) - 15 great variations.

CLIP ART (PCX)

Note: These disks contain clip art in PCX (PC-Paintbrush) format. They can be used with WordPerfect 5.0/5.1, PageMaker, Ventura Publisher, Windows or programs that read PCX files.

- ☐ Accent/Dingbats
- ☐ Alphabet Soup (2 d)
- ☐ Animal woodcuts (9 d)
- ☐ Babies (2 d)
- ☐ Birds (2 d)
- ☐ Business (2 d)
- ☐ Butterflies
- ☐ Cars
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- ☐ Kids/Caricatures (2 d)
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- ☐ Men (2 d)
- ☐ Misc (4 d)
- ☐ Months

- ☐ Church (4 d)
- ☐ Education (2 d)
- ☐ Family (2 d)
- ☐ Fish
- ☐ Food (2 d)
- ☐ Old F. banners (4 d)
- ☐ Sport (4 d)
- ☐ Teddy Bears (2 d)
- ☐ Travel (2 d)
- ☐ Wedding (3 d)

DESKTOP PUBLISHING

- ☐ Banner & Sign makers - Banners or signs for any occasion.
- ☐ Optika 2.20 - Paste-up program reads all kinds of Graphics files.
- ☐ PrintPartner (2 d) - PrintMaster & PrintShop clone.
- ☐ TEX 3.0 (20d) - Computer typesetting language (requires book £28.45) + Latex 2.09 + DVI2RV (10 d) - Computer typesetting language.
- ☐ Typesetter PC 1.8 (2 d) - True WYSIWYG shareware DTP program.

EDUCATION

- ☐ Amy's First Primer - Six learning programs ages 4-8. (CGA)
- ☐ Language Tutors - German, French, Spanish, Italian, Cantonese, Japanese, Hebrew.
- ☐ Lotus 2.2 Learning System (5 d) - Learn Lotus easily and quickly.
- ☐ Pre-School Education (2 d) - A Collection of Simple tests and games with good reward, and lots of colours and sounds (CGA).
- ☐ The DOS Learning System - Learn to use DOS with this great program. Covers all versions of DOS 2.0-4.01.
- ☐ Translators/Dictionaries: German, Italian, Spanish.
- ☐ Tutor DOS (4 d) - The supreme DOS tutorial. Everything you wanted to know about DOS and more! (HD)
- ☐ Typing Teacher - Five programs to improve speed and accuracy!
- ☐ World 2.99 - Globe! Learn about cities & countries. (CGA).

EGA/VGA GAMES

- ☐ Armada 1.0 (2 d) - Game fashioned after Battle Ship.
- ☐ Caddisback - Golf game, great graphics.
- ☐ Captain Comic 4 - Fabulous sound, graphics & more!
- ☐ Commander Keen volume I - Invasion of the Vorticons.
- ☐ Commander Keen volume II (2d) - Goodbye Galaxy.
- ☐ Dark Ages - From the creators of Commander Keen!
- ☐ Ouka Nakem - Top quality arcade game 640K (HD).
- ☐ Last Halt of Darkness - Graphics Adventure game.

WINDOWS 3.0 GAMES

- ☐ Bang! Bang! 1.0 - Artillery game.
- ☐ Chess for Windows - Play the tremendous game of chess.
- ☐ Games for Windows 1 - Klots, Worm War, Almonds, Lunar Landers, Checkers, Backgammon and more!
- ☐ Games for Windows 2 - Space Walks, Hextris, Mines.
- ☐ Games for Windows 3 - Tetris, Concentration, Taipei, Arachnoid
- ☐ TAIPEI 5.0 - Mahjongg for Windows.
- ☐ WinWheel 1.2 - 'Wheel of Fortune' type game.
- ☐ War heads 1.0 - Missile command type game.

WORDPERFECT 5.0/5.1

- ☐ Art & Graphics Vol. 1 (2 d) - Over 90 graphics.
- ☐ Art & Graphics Vol. 2 (2 d) - Another 90 graphics.
- ☐ Art & Graphics Vol. 3 (2 d) - 90 further graphics.
- ☐ Art & Graphics Vol. 4 (2 d) - 90 more graphics.
- ☐ Art & Graphics Vol. 5 (2 d) - 90 more different graphics.
- ☐ By Design - Desktop publisher and Graphic Design for WP.
- ☐ PC-Draft II & III (2 d) - Art/graphics for WP 5.0/5.1. (CGA)(HD).
- ☐ Super WP 2.2 (4 d) - Can emulate WordPerfect and others.

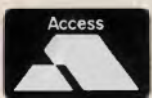
- ☐ WordPerfect 5.1 Learning System (3 d) - Learn how to use WP easily and quickly with this great tutorial (WordPerfect is NOT required).
- ☐ WordPerfect 5.1 Macros (2 d) - Over 100 worthwhile macros.
- ☐ WordPerfect 5.0/5.1 Tools (2 d) - 17+ Fantastic utilities.

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- ☐ Money Smith 1.2 - Double-entry accounting system.
- ☐ Organize! 1.5 - Personal Information Manager.
- ☐ Painless Accounting 1.0 - Full featured system.
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- ☐ Toolbook Programs Vol. 2 (2 d) - More as above.
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- ☐ Unicorn 3.0C - Great communications program.
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- ☐ Wallpaper Glamour Collection (4 disks).
- ☐ WinBatch - Windows batch language.
- ☐ WinCheck 3.0H (2 d) - Chequebook program.
- ☐ WinQVT - Terminal emulator and communications.
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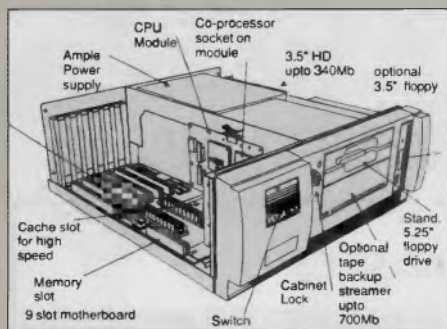
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9 PIN PRINTERS



192 CPS **80 COLUMN**

- Citizen Swift 9 - 9 pin - 80 column
- 192cps Draft, 48cps NLO
- 8K Printer Buffer + 3 Fonts
- Parallel Interface
- Graphics Resolution: 240x240dpi
- Epson and IBM Emulation
- FREE Colour Kit
- FREE Silica Printer Starter Kit

RRP: £239
STARTER KIT: £25
TOTAL RRP: £264
SAVING: £122
SILICA PRICE: £179



192 CPS **136 COLUMN**

- Citizen Swift 9x - 9 pin - 136 column
- 192cps Draft, 48cps NLO
- 8K Printer Buffer + 3 Fonts
- Parallel Interface
- Graphics Resolution: 240x240dpi
- Epson and IBM Emulation
- A3 landscape printing
- FREE Silica Printer Starter Kit

RRP: £329
STARTER KIT: £25
TOTAL RRP: £354
SAVING: £105
SILICA PRICE: £249

24 PIN PRINTERS



216 CPS **80 COLUMN**

- Citizen Swift 24e - 24 pin - 80 column
- 216cps Draft, 72cps LQ
- 8K Printer Buffer + 5 Fonts
- Parallel Interface
- Graphics Resolution: 360x360dpi
- Epson, IBM & NEC P6+ Emulation
- FREE Colour Kit
- FREE Silica Printer Starter Kit

RRP: £365
STARTER KIT: £25
TOTAL RRP: £390
SAVING: £139
SILICA PRICE: £259



192 CPS **80 COLUMN**

- Citizen Swift 24 - 24 pin - 80 column
- 192cps Draft, 64cps LQ
- 8K Printer Buffer + 2 Fonts
- Parallel Interface
- Graphics Resolution: 360x360dpi
- Epson and IBM Emulation
- Colour Option Available
- FREE Silica Printer Starter Kit

RRP: £269
STARTER KIT: £25
TOTAL RRP: £294
SAVING: £95
SILICA PRICE: £199

NOTEBOOK PRINTER



64 CPS **80 COLUMN**

- Citizen PN48 Notebook Printer
- Non-impact Printing On Plain Paper
- LASER DUALITY - 64cps
- 4K Printer Buffer + 2 Fonts
- Rear and Bottom Paper Loading
- Parallel Interface
- Graphics Resolution: 360x360dpi
- Epson, IBM, NEC P6+ & Citizen Emulations
- Power: Mains, Battery or Car Adapter
- FREE Silica Printer Starter Kit

RRP: £325
STARTER KIT: £25
TOTAL RRP: £350
SAVING: £101
SILICA PRICE: £249

24 PIN PRINTER



192 CPS **136 COLUMN**

- Citizen Swift 24x - 24 pin - 136 column
- 192cps Draft, 64cps LQ
- 8K Printer Buffer + 4 Fonts
- Parallel Interface
- Graphics Resolution: 360x360dpi
- Epson, IBM & NEC P6+ Emulation
- A3 landscape printing - FREE Colour Kit
- FREE Silica Printer Starter Kit

RRP: £459
STARTER KIT: £25
TOTAL RRP: £484
SAVING: £135
SILICA PRICE: £349

24 PIN PRINTER

GOLD AWARD
Best Budget Printer 1990
Micro Decision

- Citizen 124D - 24 pin - 80 col
- 144cps Draft, 48cps LQ
- 8K Printer Buffer + 2 Fonts
- Parallel Interface
- Graphics Res: 360x360dpi
- Epson and IBM Emulation
- FREE Silica Printer Starter Kit

144 CPS **80 COLUMN**

RRP: £249
STARTER KIT: £25
TOTAL RRP: £274
SAVING: £105
SILICA PRICE: £169

ACCESSORIES STARTER KIT

FREE!
Worth: £25 +VAT=£29.38

To get you up and running with your new printer from Silica:

- 2 1/4" Disk - Amiga & ST Drivers
- 3 1/2" Disk - Drivers for Windows 3
- 2 Metro Parallel Printer Cable
- 200 Sheets of Continuous Paper
- 100 Continuous Address Labels
- 5 Continuous Envelopes

If you already own a printer, and would like to buy a kit, you may order one (ref KIT 5500) for £24.95 - £5 off RRP!

COLOUR KITS

- PRA 1236 Swift 9/24/24e £35.25
- PRA 1240 Swift 24e £35.25
- PRA 1248 P48 Battery £59.79
- PRA 1155 P48 Cable Exp £1.00
- PRA 1152 P48 Car Adapter £1.00

All prices include VAT and Free Delivery.

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- **PRICE MATCH:** We normally match competitors on a "Same product - Same price" basis.
- **ESTABLISHED 12 YEARS:** Proven track record in professional computer sales.
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- **FREE CATALOGUES:** Will be mailed to you with offers and software/peripheral details.
- **PAYMENT:** By cash, cheque and all major credit cards.

Before you decide when to buy your new printer, we suggest you think very carefully about WHERE you buy it. Consider what it will be like a few months after you have made your purchase, when you may require additional peripherals or software, or help and advice. And, will the company you buy from contact you with details of new products? At Silica Systems, we ensure that you will have nothing to worry about. We have been established for over 12 years and, with our unrivalled experience and expertise, we can now claim to meet our customers requirements with an understanding which is second to none. But don't just take our word for it. Complete and return the coupon now for our latest Free literature and begin to experience the "Silica Systems Service".

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LONDON SHOP: Selfridges (1st Floor), Oxford Street, London, W1A 1AB Tel: 071-629 1234
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55D

VASSTEC

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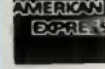
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WORD PROCESSING

WordPerfect - prints Wordstar and ASCII files in over 30 high quality fonts.
By Design - desktop publishing and graphic design capabilities for WordPerfect, including design tools, clip art etc (req WordPerfect - Shareware).
Children's Wordprocessor - menu driven, large on-screen fonts, includes simple drawing.
FastType typing tutor with good graphics test speed and accuracy.
Flex - professional editor with optional BAK files, autoreview, macros, up to 10 windows (Williams).
Fontastic - fancy fonts with font designer. Galaxy Vite Vite - latest version of formerly Galaxy Vite Vite, ideal for small WP tasks, and easy to use.
LO Vite - memory resident print enhancement, works alongside your word processor.
Headreader - guesses your next word, suitable for scientists, doctors etc.
Multilingual WP (11 disks) - latest WP with support for Arabic, Eulopean, Farzi Persian, Gaelic Irish, Greek, Hebrew, Polish, Russian, Turkish, Urdu & Yugoslavian.
Multitool - electronic thesaurus, which can operate as a standalone program, or as plug-in.
8-Edit fully functional text editor with large character sets, suitable for vision-impaired users, includes 50 Wordstar commands and 60,000 word dictionary.
PC Outline - memory resident thoughts organiser. Up to 9 outlines on-screen with resizable windows.
PC Type 4 (4 disks) - latest version of Buntowne favourite can now work on up to 10 files, with boxes, lines and calculations. Hard disk req.
PC Write - can display mathematical formulae, can display mathematical editing. Uses ASCII files, make disk.

DATABASE MANAGEMENT

Card Index - simple filing system. Can print out 3x5 cards.
Cardinal (9 disks) - powerful mailing list manager. Over 30,000 names and addresses per list, duplication detection, post code formatting for over 100 countries, merge split, output on labels up to 8 wide. 100000 cards. Hard disk req.
Dbase III+ (2 disks) - well, not quite, but Windows users. Dbase files, does reports, supports networking and more. Requires hard disk.
HyperShell (3 disks) - multi-file Hypertext reference system, help system and menuing system. Has intelligent text viewer, directory browser, file manager and applications. User interface prototyping with pop-up menus etc.
PC File Y (3 disks) - latest version of Buntowne's popular database system. Many powerful features but friendly and easy to use. Requires PC file & PC file disk. Hard disk req.
Speciality Database Software - store up to 1,000,000 records with search and report. 1 disk each subject (available separately): Record Collection, Book Indexes, Photographs, Antiques, Coins, Comics, Films / Videos, Home Inventory, Insurance, Memorabilia, Stamps (Comcraft).
SR-Info (9 disks) - dBase compatible database system with programming language, 8000000 screen designs, 6 databases open simultaneously, 65,000 records per file, versatile report writer (hard disk req. - Sub total).

SPREADSHEETS

As Easy As - amazing Lotus 123 compatible spreadsheet, reads 193 files, macros etc.
Lotus 123 Worksheets & Macros - includes cash flow, line-of-credit tracker, ratio analyzer, sales calculator, growth capacity calc, queue analysis, new venture budget, quote generator.
Lotus 123 Worksheets (3 disks) - includes financial analysis, import utility, linear sales, biometrics, travel business expenses, flowchart symbols, stock portfolio analysis, rental property analysis.
Lotus 123 Tutorial - covers menus, printing and databases (Release 2 QN07).
PC Calc & VB (3 disks) - new features, more powerful, still integrates with PC file & PC file type & extensive manual. Hard disk req.
Phot - high quality Epson printed output 'add-on' for As Easy As, with portrait & landscape, & NAG fonts, complete page layout control etc (Hard).
Slide Writer - print out ASCII files on their side, ideal for wide spreadsheets.

GAMES/TRIVIA

Alutruke - fighter aircraft shoot-em up with vector graphics, much speed, night and daytime missions (CSA and joystick req) (Rufus).
Archie Games (4 disks) - includes Bugst, Jumpbox, Delroids, Nuclear Attack Simulation, 3-Demon, Kong, Bricks, Pyramid, Pitfall, PC-Golf.
Backgammon
Bermuda Triangle - sailing quest (EGA ONLY).
Blackjack - accurate simulation.
Casino Games - includes Bridge, Othello, Roulette.
Castle - popular adventure.
Cave Quest - fantasy role-playing game.

EGA Wheel/VGA Wheel - like popular wheel of fortune game, please state VGA or EGA.

Football Forecast - book prediction system has support for 214 teams in English & Scottish leagues showing form, predictions and permutations.
Ford Simulator II (9 disks) - 16 models, 4 events including Grand Prix, also buyers guide and ordering information.
Grand Prix - from authors of Popstar Soccer Game etc.
Hack! - adventure. DND style.
Games 15 - Star Wars, Sea Wolf, Frogger etc.
Games 16 - Solvers, Bricks, FLIGHTMAZE, Games 17 - Pac Man, Roller, Castle, Invaders etc.
Get Lucky! - adult games.
Madly - like oriental rummy with PUNGS KONGS & CHOWS.
Monopoly/Tune Thru - US version of famous board game. Tune Thru like Name That Tune.
PC Chess - play the computer or a friend, save load etc.
Pharaoh's Tomb - archaeological arcade action.
Pinball Rally - three versions of popular game.
Scrabble - computer version of popular board game.
Sea Battle - naval game spanning World War I & World War II. No save or load in this version (Rufus).
Starlord - high adventure in a distant galaxy.
The Popstar - cope with pressures of sex, drugs and rock 'n' roll as you tour the world.
Slush - murder adventure.
Spacewar - shoot 'em up with good graphics.
Spartan - yard game of one several teams and steer them towards glory.
Super Power - Six-a-game of superpower economics, trade and military conflict.
Tinny (3 disks) - The Tinny Machine has several character sets and levels.
Wily The Worm - leaders, rolling barrels.

BUSINESS/VERTICAL

Easy Project - up to 5000 tasks, Gantt charts, automatic schedule generation, instant reports, dBase file compatibility (Rufus).
Form Creation - design, save forms, save forms with data, printout. EZ Forms Exec.
Estate Agents System - storage and retrieval of information about properties, pending and closed sales, plus agents' details and helpful reports.
Estrobel (5 disks) - contractors estimating costing analysis includes sub-contractors, materials, transport costs etc.
Invoice and Statements - simple to use, customer database, single or period invoices, auto-billing, account summary with aged debt/VAT (Software Foundation Ltd).
Job Cost (2 disks) - simple to use, powerful, cost monitoring system, with transactions, reports and utility (hard disk req. - Micro Data Asset).
Leadmaster - sales program which tracks customers, prospective customers, and has progress file, re-contacts, standard letters etc.
Make My Day - new version of this Time Management system, Appointment Calendar, Job Scheduler, Time Log and Expense Account Manager.
Marketstar - sales prospecting system and contacts manager with built-in W9 test data entry, phone call history, appointments, milestones etc (Stering).
PD50 - Quote - Quotation system, now includes content, sensitive help, pop-up calendar, pop-up calculator, import data etc (Pro Dev Software).
Quickbid - Estimating package for Electricians, Plumbers, Builders.
Salesman - sales management which includes Clients, Product analysis, Note Pad and Appointments Diary. (Hard disk req.).

MISCELLANEOUS

Disk Copy Service - over 300 formats of floppy, test for disks.
Disk Duplication - we can provide small to medium sized jobs (100-10,000) for as little as 90p inc. media - 5.25" and 5.0" etc. media - 3.5" many formats available. Call for quote (prices etc. change/90).
Library Additions - if you have written a shareware program

Service Plus (9 disks) - Maintenance and Service, Call Trading, suitable for electrical, plumbing, heating services etc.
Superstock - stock control including suppliers, movements, POOrders, stocktake, usage, backlog, enquiries etc (McNab).
The Controller (2 disks) - powerful project organiser. (Hard disk required).

Ultimate Sales Program (2 disks) - fully integrated Sales, invoicing, retail price list system with period statements and invoices (Rufus).

ACCOUNTS/FINANCE

Billing/Invoicing System (2 disks) - itemised invoices/bills with balance forward, finance charges, subtotals, balance due, also reports.
Cashbook (3 disks) - 5 bank accounts, 5 cash accounts, payments/receipts posting, 100 nominal account/VAT codes, VAT summaries (Freeway UK).
Corporate Financial Analyst (3 disks) - company accounts analysis and planning, needs no modelling or spreadsheet experience, (Computer Financial Models UK).
Home Accounts - features checking, savings, credit cards and loan accounts with bill payments, calculator & calendar (RGS).
Home Finance Manager - keep a record of Bank/Buying Society accounts with monthly balances and details of standing orders also loan calculator with repayment interest (Blackwood Software - UK).
Intelligence (4 disks) - Combines features of both previous popular packages, Accounts and Accounts Plus into one, includes both Nominal and Analysis options. (Freeway UK).
Page Financial Controller (3 disks) - shareware clone of the similarly named package. Includes sales ledger & statements, invoicing with discounts, purchase ledger with remittances, nominal ledger, cashbook & VAT. Stockholder processing & job costing, network ready (Page Consultants UK). Hard disk required.
Payroll (3 disks) - latest legislation, (Freeway UK).
Simple Accounts - includes sales, purchase and nominal ledgers, cashbooks and bank reconciliation, VAT etc (Hovars).

GRAPHICS

Altamir - design posters, cards, logos, garden floor plans.
Clip Art 1 (3 disks) - approx 190 trade logos/computer motifs for use with TimeWorks Venture.
Clip Art 2 (3 disks) - approx 200 images including Office, Dwell, RM, Pans, Scissors etc for use with TimeWorks Venture.
Danced (5 disks) - from simple letterheads to complex 3D cog-wheels with animation & rotation, now has support for post-script laser printers (hard disk req).
DROEGER (9 disks) - Printed Circuit Board Design.
Draft Choice - one of the easier to use CAD systems which includes drop-down menus, on-line help, drawing, editing, viewing, measurement/quantity options plus more from the authors of As Easy As (Tufus).
Express Graph - 3D bar charts, pie charts, line graphs etc. from entered or imported data.
Finger Paint - paint program with Mac-like screen.
Gen Drawings/Paintings - Fun collection of images including Dinosaur, Ghost Busters Logo, Star Ship Enterprise etc.
NorthCAD 3D (formerly Quest 3D) - is a new version of this wire frame modelling system with view, zoom etc, now support CGA, EGA and VGA.
PC May Draw (4 disks) - latest version of popular CAD package now includes library disk, tutorial, and manual disks with superb demo and utility to convert graphics to MAG format for DTR.
Quickroute - multi-layer PCB design with autorouter, zoom, pan, redraw, menus, windows (Fros).
Slide Presentation - use camera to take snapshots of screen, then display as a slide show, ideal for training, demonstrations etc.
Smart Art (2 disks) - clip art collection in 'JPG' format including Animals, Insects, Reptiles, People, Vehicles, Business etc. (Bennett).

EDUCATIONAL/STATISTICS

Amey's First Printer (ages 4-8) - new computer version, is a collection of fun games for young children that help them with skills like counting, letter recognition, simple problem solving, pattern recognition and keyboard use.
Arctus Professional (4 disks) - Statistical package including Students T-Test, F-Test, 2-Test, also linear, geometric & exponential regression analysis, Qualifiers/Winners etc (Bachar).
Children's Games (ages 4-8) - hangman, alphabet, animals etc.
Eclipse - word and grammar game like hangman except guess words from document rather than letters from a word (J Higgins).
Flash Cards (4 disks) - 7,500 word vocabulary builder and spelling teacher (Advanced).
French Tutor - 1,648 French/English word combinations, 3,900 verb conjugations and 196 French/English phrase combinations.
Funnets & Buckets - Simple arithmetic tutor with arcade type action.
Fun with Designs - creative drawing program for young children. (Wescott).
Fun with Letters & Words - Educational games for the very young. (Wescott).
GCSE Physics / Computer Science / Mathematics (3 disks available separately) - exam revision.
German Tutor - 1,600 German/English word combinations, 3,875 verb conjugations and 160 German/English phrase combinations.
IQ Builder - Intelligence testing.
Italian Tutor - 816 Italian/English word combinations, 1500 verb conjugations and 114 Italian/English phrase combinations.
Users Adding & Quiz Machine - quiz question and practice program for addition, subtraction, multiplication, division.
Maths/Statistics - 26 maths routines including prime factors, vector analysis, linear interpolation, gaussian quadrature etc, plus 18 stats calculations including Mann-Whitney, Chi-square, students, T-test, multiple linear regression etc.
Memory Master - improve memory powers with these techniques.
PC Calc - a computer assisted learning package that allows you to write tutorials, tests, rolling demos etc.
PC Learning Games (4 disks) - series of programs for 2-8 year olds includes simple arithmetic, word & letter recognition, basic keyboard skills, colours & shapes (Prosear).
PC Prompt - pop-up help with DOS command line.
Play 'n' Learn (ages 2-4) - for the very young, alphabet recognition, computer reaction etc, including Ammandas Letter Lotto.
Spanish Tutor - 1,550 Spanish/English word combinations, 3,596 verb conjugations and 150 Spanish/English phrase combinations.
Tutor - introductions to computers, binary numbers and the CPU, input/output devices, Disk Operating System, subdirectory structures, batch files etc.
What Quiz - arithmetic/elementary mathematics, self grading according to age of user.
Word Gallery - Flashcards with matching, missing letters, spelling, word guessing (EGAVGA - Knowware).

World Atlas - produces views and maps for areas around a chosen point, allowing selection of resolution size etc.

LANGUAGES/PROGRAMMING

ASB/DB6 - probably the best 8086 assembler/assembler around.
Basic Aids (4 disks) - G.W. basic, B-Windows/Window - windowing utility for Basic & C.
C Tutorial - for beginners to advanced.
C Spot Run (2 disks) - window and menu units for C programmers.
Hyperpad (5 disks) - similar to the Apple Mac's Hypercard, an object-oriented application development system, complete with more than two dozen personal applications (hard disk req. - Brightbill - Roberts).
Logo - Java version of turtle-based graphics language, popular with children.
Module 2 Compiler (3 disks) - new version (B.D.A.) of this flexible but very powerful programming language.
Module 2 Tutorial (2 disks) - companion to the above.
WFF Forth (2 disks) - full implementation.
 Pascal - three compilers on one disk, Tiny, Facile & Visible.
Prolog - ADA implementation of 5th generation AI language.
Quickbasic - tools and utility.
SDA (2 disks) - design screens for data input (Besp).
Turbo C Tutor (2 disks) - routines, programs, utility, statistics, sprites, animation, tools and much more.

UTILITIES

Ample Notice - appointments calendar, pop-up alarm clock, sideways addressing utility for envelopes, can use data directly from the screen.
Autonume - popular front end allowing multiple levels of menu, password, uses minimum memory, network support etc. Mega.
Label Maker/News Editor - design labels and include graphics from NewsMaster graphics editor (Draal UK).
Professional Mailmaker - disk utility line Norton's including file recovery, unerase etc.
Ram Test - chip diagnostics.
SimCGA - colour graphics simulator for Hercules cards, runs most CGA software.
Sydes Utilities (2 disks) - including Anadisk for analysing what's REALITY on a disk, Teledisk which can make an image of a complete disk with sub-directories etc (even some protected disks) which you can then download or upload with the help of a modem, and utility and emulator to handle over 100 CPM formats on your PC.
Vinix (2 disks) - multi-user operating system along the lines of unix, adjusts itself to 8086 or 80286.
Zapcode - (optional) Memory resident printer control utility to select fonts, margins etc for use with dot matrix, laser, inkjet etc (Morton Utilities).

SPECIAL INTEREST

Astronomy/Horoscopes - both signs, zodiacs etc.
Broke (7 disks) - includes Semblance to allow quick search and retrieval of words, phrases etc (Bayless UK). Hard disk required.
Crystal Ball - 4 computerized 'psychic' makes predictions and answers (R.K. West).
ESSE - configure expert system including example which works out child's illness from questions and answers.
Fortune Teller - divination system including One Card Fortune, Three Card, Detailed Card Layout, Quick Numerology, Dice etc (R.K. West).
Genealogy - EZ tree traces and plots your ancestral roots.
Handwriting Analyst - personality analyses system of handwriting, often used when evaluating job candidates (Carsonsoft).
Handwriting Numerology - Handwriting and numbers analysis for those who can feel the 'vibrations'. Also includes Astrology.
Personal Tarot - enjoy professional quality Tarot card readings on your PC, easy to use, flexible, customizable with professional looking reports.
Nanoman - play, enter and save tunes, also construct stand alone tunes.
Proton Fortune - analysis of personality according to both Western & Eastern astrology. Also compatibility ratings, etc.
The Diet Disk - has several calculations for average weight loss, calories needed etc and shopping list showing calories.

COMMUNICATIONS

Fido - very popular bulletin board system with E-mail facilities and network capabilities, several in use throughout UK/Europe/USA.
HamIt (2 disks) - file transfer between mainframes/PC's, many non-IBM machines covered too.
PC VT - DEC VT 100/100S2 terminal emulation with file transfer.
Odyssey - powerful but flexible package with many extras.
WinCard (2 disks) - new bulletin board system which is easy to set up but very impressive.

SOFTWARE

PC File V...	£89.00
As Easy As	£45.00
Autonume	£55.00
Page Financial Controller	£125.00
PC Outline	£59.00
Power Menu	£59.00
Freeway Cashbook V4	£49.95
Freeway Ledgermaster	£49.95
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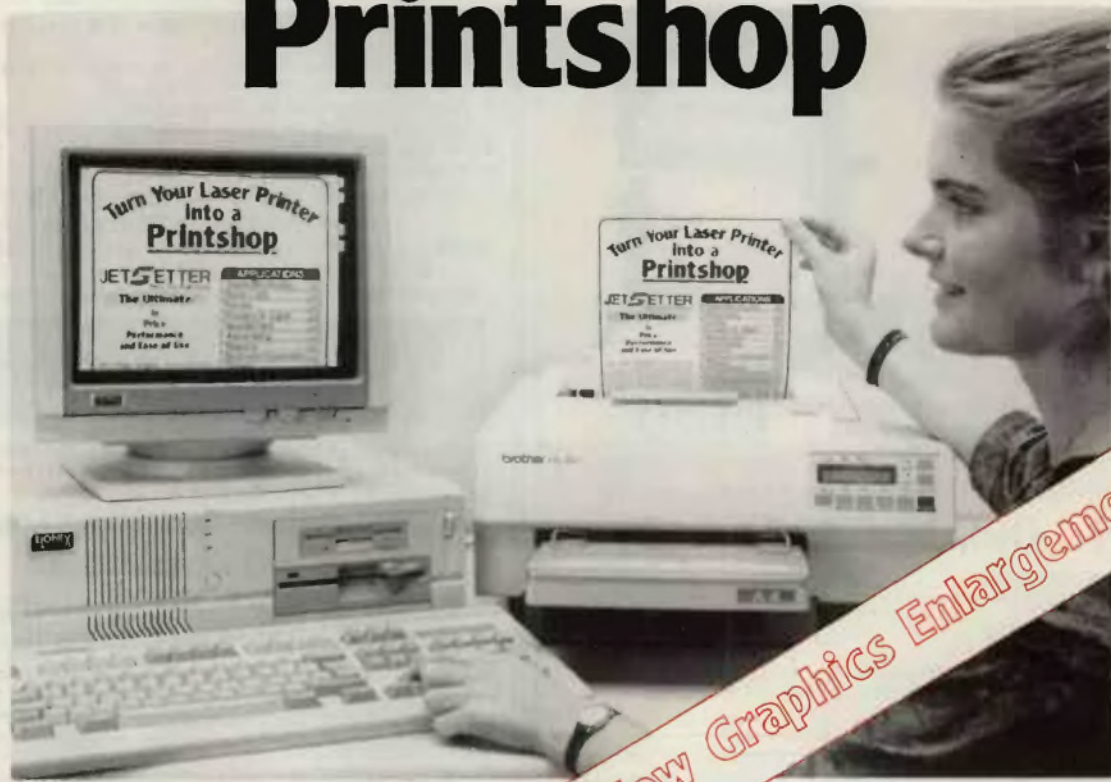
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
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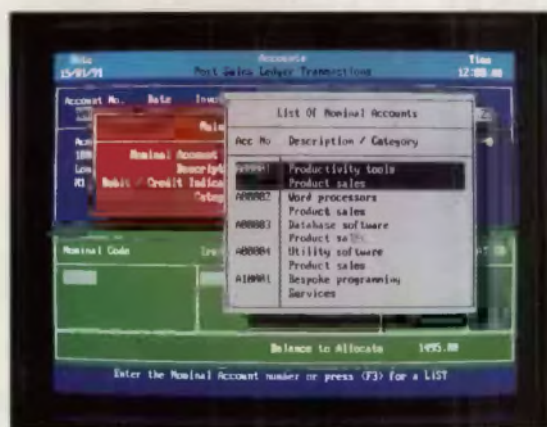


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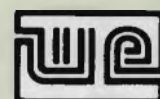
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AT286 £399

•80286 Processor •8/16MHz switchable •1MB RAM on-board expandable to 4MB •Co-Processor socket •EMS LIM 4.0

Monitor	14" Mono Super VGA (1024x768)	14" Colour Super VGA (1024x768)	14" Colour XGA Multiscan (1024x768-N.I.)
No HDD	£ 479	589	635
40MB/28ms	£ 605	715	759
105MB/17ms	£ 705	815	859
210MB/14ms	£ 805	915	959
330MB/14ms	£ 1205	1315	1359

386DX-40 Cache £689

•80386DX-40 Processor •64K Cache RAM expandable to 256K •8/40MHz switchable •1MB RAM on-board expandable to 32MB •Co-Processor socket •Landmark rating 94.8MHz

Monitor	14" Mono Super VGA (1024x768)	14" Colour Super VGA (1024x768)	14" Colour XGA Multiscan (1024x768-N.I.)
No HDD	£ 769	879	925
40MB/28ms	£ 895	1005	1049
105MB/17ms	£ 995	1095	1149
210MB/14ms	£ 1095	1195	1249
330MB/14ms	£ 1495	1595	1649

486DX-33 Cache £1049

•80486DX-33 Processor •256K Cache RAM •8/33MHz switchable •4MB RAM on-board expandable to 32MB •Weitek socket •Landmark rating 152MHz

Monitor	14" Mono Super VGA (1024x768)	14" Colour Super VGA (1024x768)	14" Colour XGA Multiscan (1024x768-N.I.)
No HDD	£ 1129	1239	1285
40MB/28ms	£ 1255	1365	1409
105MB/17ms	£ 1355	1465	1509
210MB/14ms	£ 1455	1565	1609
330MB/14ms	£ 1855	1965	2009

386SX-25 Cache £529

•80386SX-25 Processor •16K Cache RAM expandable to 128K •8/25MHz switchable •1MB RAM on-board expandable to 16MB •Co-Processor socket •Landmark rating 36MHz

Monitor	14" Mono Super VGA (1024x768)	14" Colour Super VGA (1024x768)	14" Colour XGA Multiscan (1024x768-N.I.)
No HDD	£ 609	719	765
40MB/28ms	£ 735	845	889
105MB/17ms	£ 835	945	989
210MB/14ms	£ 935	1045	1089
330MB/14ms	£ 1335	1445	1489

486SX-20 £829

•80486SX-20 Processor •Optional 128K Cache RAM •8/20MHz switchable •4MB RAM on-board expandable to 16MB •Co-Processor socket •Landmark rating 66.8MHz

Monitor	14" Mono Super VGA (1024x768)	14" Colour Super VGA (1024x768)	14" Colour XGA Multiscan (1024x768-N.I.)
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210MB/14ms	£ 1235	1345	1389
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486EISA-33 Cache £1749

•80486DX-33 Processor •256K Cache RAM •8/33MHz switchable •4MB RAM on-board expandable to 32MB •Weitek socket •Landmark rating 162MHz

Monitor	14" Mono Super VGA (1024x768)	14" Colour Super VGA (1024x768)	14" Colour XGA Multiscan (1024x768-N.I.)
No HDD	£ 1829	1939	1985
40MB/28ms	£ 1955	2065	2109
105MB/17ms	£ 2055	2165	2209
210MB/14ms	£ 2155	2265	2309
330MB/14ms	£ 2555	2665	2709

Aries System Options

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- Panasonic CD ROM Drive add £299
- CD Bundled software (World Atlas, Games, I. Encyclopedia) add £49
- Additional 3.5" 1.44 or 5.25" 1.2M Drive add £45
- Additional 1MB RAM Module add £29
- Super VGA Card with 1MB RAM add £50
- Aries Windows Accelerator Card (Increase speed by up to 200%) add £199
- IDE Hard Disk Cache Controller (ISA 0.3ms access speed) add £199
- Aries Sound Booster Card with MIDI & J'Stick interface add £129
- PC Workstation Trolley add £85

Aries Monitor Options

Note: The additional amount is to be added to the 14" Colour XGA Multiscan Monitor System price.

- 14" Alphascan Plus 0.28mm (1024x768 Non Interlaced) add £49
- 14" MC3000 Monitor 0.28mm (1280x1024 Non Interlaced) add £99
- 14" MC4000 Trinitron 0.25mm (1280x1024 Non Interlaced) add £199
- 17" MC5000 Monitor 0.26mm (1280x1024 Non Interlaced) add £599
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Monochrome: 14" Flat Screen, Non-Glare, High Resolution paper white, VGA Monitor. Caters for CGA, EGA, VGA. Supplied complete with Swivel base.

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• Super VGA Card (8/16 Bit) £49

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Aries Multiscan Monitors

Alphascan Plus

This new 14" colour monitor provides automatic adjustment for horizontal frequencies between 50 and 90 Hz. This, combined with its 0.28mm dot pitch tube and anti-glare treatment, gives sharper text and graphics resolution up to 1024 x 768 on a non-interlaced flicker free display (XGA standard). Operation is made simply by use of the front mounted controls for comfortable and easy setup. Supplied with tilt and swivel base.

Aries Alphascan 17 Plus £325

17" Flat Screen Monitor

specification as above £695

Aries MC3000

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"...provides unquestionable picture quality at VGA...it supports VGA in 1024 x 768 in non-interlaced mode."

"The huge bandwidth of the monitor means that it should be able to support display modes not even invented yet, certainly XGA."

"In the not too distant future, monitors with this level of sophistication are going to become commonplace for PC users. But for the moment, the Aries MC3000 is state-of-the-art."

Computer Shopper Nov 1991

Aries MC3000 £395

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RX/FX80/85/800/MX80	£2.95	£4.95
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• P110 for KX-P1081, 1592, 1595 & 1695 £6
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Panasonic Ribbons cont'd

• P145 for KX-P1123/24 £6
• P140 for KX-P1540 £8
• P155 for KX-P1624 £8
• Colour Ribbons for KX-P1081, 1592, 1595 & 1695 Brown, Blue or Red £9 each

Epson Printers

• DFX5000 £1079 • LQ870 Col £355
• DFX8000 £1940 • LQ1010 £270
• EX1000 Col £428 • LQ1050+ £207
• FX850 £265 • LQ1060 Col £595
• FX1050 £340 • LQ1070 £315
• LQ200 £164 • LQ1170 £437
• LQ450 £165 • LX400 £101
• LQ570 £205 • LX850+ £140
• LQ860 Col £445 • SQ850 £432
• SQ2550 £625

Cut Sheet Feeders for

• LX400/800/850/LQ400/500/550 £69
• EX800/FX800/850/LQ800/850 £130
• FX/LQ1000/1050/SQ850 £159
• LQ255 £176 • SQ2550 £390

Tractor Feed for

• LQ800 £44 • LQ850/FX850£69
• LQ1050/FX1050£85 • LQ2500 £90
• LQ2550 £90

Accessories

• EX800/1000 Colour Option £55
• EX800/1000 Colour Ribbon £18
• LQ2500 Colour Option £65

Epson Printer Interfaces

All these interfaces fit inside the printer

• RS232 £28
• RS232 + 2k Buffer £52
• IEEE 488 £95
• RS232 + 8k Buffer £75

Printer Leads

• IBM Parallel Lead 2m £4
• IBM Parallel Lead 5m £10
• IBM Parallel Lead 10m £15
• Double ended 36 way
• Centronics lead 4' £7
• Double ended 36 way
• Centronics lead 6' £9
• RS232 lead (various) POA
• IBM Keyboard extension lead coiled £5

Universal Printer Sharers

Connect up to 5 micros to 1 printer or 5 printers to 1 micro with our combined Sharer/Changerswitch boxes.

Standard Low Cost Sharers

Connects	Serial	Parallel
2 to 1	£10	£11
3 to 1	£13	£14
4 to 1	£16	£17

Professional Sharer Units

Connects	Serial	Parallel
2 to 1	£17	£18
3 to 1	£22	£25
5 to 1	£34	£38

Handy Printer Switch

A 2 way printer switch can be attached to the micro or monitor for ease of use. Centronics £18 Serial £17

Auto Printer Sharer Switch

Connects	Serial	Centronics
2 to 1	£38	£40
4 to 1	£59	£59
8 to 1	-	£89

256K Multi Spooler

These Auto Centronics Printer Sharers have built-in 256K of Printer Buffers. They can be used as Auto Sharers, Printer Buffers or both.

• 2 in/2 out £135
• 4 in/2 out £145
• 8 in/1 out £199

(Cables for all printer switches are extra @ £6 each. Please specify the type required when ordering.)

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Compact Converter Units

• Serial to Parallel	£36
• Parallel to Serial	£37

Listing Paper (Perforated)

• 1,000 Sheets 9.5" x 11" Fanfold	£7
• 2,000 Sheets 9.5" x 11" Fanfold	£11
• 1,000 Sheets 9.5" x 11" NCR 2 Part Fanfold	£21
• 1,000 Sheets 15" x 11" Fanfold	£9
• 2,000 Sheets 15" x 11" Fanfold	£16
• 1,000 Sheets true A4 Fanfold Paper 70gms	£11
• 2,000 A4 Fanfold Paper	£19
• Teletypewriter Roll (Econo paper)	£4

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached.)

Printer Labels

(On continuous fanfold backing sheet)

• 1,000 90 x 36mm (Single Row)	£6.00
• 1,000 90 x 36mm (Twin Row)	£6.25
• 1,000 90 x 49mm (Twin Row)	£7.50
• 1,000 102 x 36mm (Twin Row)	£6.75

Laser Printer Labels on A4 Sheets

• 3750 - 70 x 29mm (3 Rows)	£13.50
• 3000 - 70 x 32mm (3 Rows)	£13.25
• 2625 - 70 x 42mm (3 Rows)	£13.00

Maths Co-Processors

• 8087-5MHz	£50	• 80387-16	£119
• 8087-8M	£73	• 80387-20	£99
• 8087-10M	£95	• 80387-25	£125
• 80287-8	£40	• 80387-33	£119
• 80287-10	£45	• 80387-40	£164
• 80287-12	£46	• 80387SX-16	£69
• 80287-20	£50	• 80387SX-20	£79
		• 80387SX-25	£92

Books (No VAT)

Carriage on books varies between £2 to £3.50, depending on their weight	
• 1-2-3 Mastering - 2nd Ed	£20.95
• 1-2-3 Quick Ref	£8.45
• 1-2-3 Using - Release 2.2	£25.95
• Accountancy software in Business - Using	£14.95
• Advance C Tech & Application	£19.95
• Aldus Pagemaker	£27.95
• Amstrad 9512 - Using the	£10.95
• Amstrad Basic 2 - User Guide	£9.95
• Amstrad Tech Manual for 1640	£19.95
• Assemblage Language Quick Ref	£20.95
• Autocad 4th Ed - Mastering	£31.50
• Autocad - Inside 6th Ed	£36.95
• Autocad - Inside Release 11	£32.45
• Autocad Mastering Through Ref II	£28.85
• Business Companion on the 1640	£12.95
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• C-Programming Language 2nd Ed	£26.95
• C - Teach Yourself	£19.95
• Clipper - Using 2nd Ed	£27.95
• Computer Users Dictionary	£9.95
• Coral Draw 2nd Ed - Mastering	£25.50
• Coral Draw made easy	£24.95
• Coral Draw v2 Quick Ref	£8.45
• dBase IV - Handbook	£19.95
• dBase 3/4 Complete Ref	£27.45
• Deskjet Unlimited	£19.95
• DOS & BIOS Function - Quick Ref	£7.95
• DOS Power tools 2nd Ed	£19.95
• Excel for +++++ - Quick Ref	£8.95
• Fax Management - with	£7.95
• Framework 111 - Mastering	£24.50
• GW BASIC Users Guide & Ref	£12.95
• Hard Disk Instant Ref	£10.95
• IBM PC & PS/2 3rd Ed - inside the	£21.70
• IBM PC AT - Inside the	£21.70
• IBM PS/2 Handbook	£19.95
• Microsoft GW BASIC	£17.95
• Microsoft Windows - Illustrated	£21.95
• Microsoft WORD 5.5 - Using	£20.45
• MS DOS Bible 3rd Ed	£24.95
• MS DOS First Book	£15.50
• MS Windows 3 2nd Ed - Using	£22.95
• MS-DOS for Beginners	£17.45
• MS-DOS Users Guide 2nd Ed	£27.95
• MS-DOS - ABCs of 2nd Ed	£17.95
• MS-DOS - Running 4th Ed	£19.95
• MS-DOS - Supercharging 2nd Ed	£17.95
• MS-DOS Tricks and Tips	£16.45
• MS-DOS - Using	£29.95
• MS-DOS 5 Using Handbook	£19.95
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Books Cont'd (No VAT)

• MS-DOS 5 - Quick Start	£18.45
• MS-DOS 5 - Using	£29.95
• MS-DOS 5 - Using 2nd Edition	£22.95
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• Networking Personal Computers 3rd Ed	£22.95
• Norton Utilities - Inside the	£22.95
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• Novell Network - The ABC of	£21.95
• Novell Network - Using	£27.45
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• PC Crash Course 2.0 2nd Ed	£19.95
• PC Tools - Quick Ref	£8.45
• PC-DOS Using 2nd Ed Ver. 3.3	£20.45
• PC-DOS Using 3rd Ed	£21.95
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• WordStar User's Ref. manual	£12.50
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3.5" HD on a controller card. "Simply Plug and Play". For Amstrad 1640 & XT compatibles.

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• WD-XT 30MB#	£149
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Hard Disk (Bare Units)

• WEHD20 21 MB Hard Disk	£79
• WEHD30 30MB RLL Hard Disk	£119
• WEHD40/28ms 42MB HD including partitioning software	£179
• WEHD65 65MB HD RLL	£185

Disk Controller Cards

• WEXT100C XT Hard Disk Controller card and cables	£29
• WEXT200C/RLL XT Hard Disk Controller card and cables	£29
• IDE AT - 2HD/FDC/Parallel/2 Serial Games port for AT	£18
• FDC-Plus PC XT Controller card to interface H/L Density 3.5" or 5.25" FD's	£25
• FDC-4 PC XT Controller card to interface up to a 4 H/L Density 3.5" or 5.25" FD's	£35
• AT Embedded Drive Adaptor 2 x FDD/HDD only	£9

Hard Disk Kits

• WEHD20(KIT) 21 MB HD with XT-Amstrad Controller + Cables	£99
• WEHD30(KIT) 32 MB HD with XT-Amstrad Controller and Cables	£179
• WEHD40(KIT) 42 MB HD with XT-Amstrad Controller and Cables	£199

Floppy Disk Drives

• UC200 5.25" 360K 48tpi Double Sided Disk Drive	£35
• UC600 5.25" 1.2M 96tpi Double Sided High Density, Disk Drive	£38
• UC35/4 3.5" 720K Drive	£34
• UC35/6 3.5" 1.44M Drive	£35
• 5.25" Fixing kit for 3.5" Drives	£8

Tape Streamers

• WE 5000 - Tape for XT & AT. 60MB external kit with software, short controller, cable and documentation. Backs up 60MB in less than 12 minutes.	£449
• WE 2000 - Low cost internal Tape Streamer. Up to 120MB capacity. inc Software	£165
• WE 3000 - as above up to 250MB capacity	£259
• External Case, PSU & Lead for above	£79

PC External Drives

For 1640, IBM PC & Compatibles. Supplied complete with case, cables & Power Supply Unit. Ready to plug in.

• PCS-3L5 3.5" - 720K Drive	£75
• PCS-3H5 3.5" - 1M44 Drive	£85
• PCS-5L2 3.5" - 360K Drive	£69
• PCS-5H2 3.5" - 1M2 Drive	£89

N.B. Not all XT compatible micros can accept the high density drives.

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• 180MB	3.5"	17mS	£545
• 330MB	F/H	18mS	£725
• 670MB	F/H	16mS	£1395

AT IDE Drives

• 44MB	3.5"	28mS	£125
• 100MB	3.5"	17mS	£219
• 200MB	3.5"	16mS	£370
• 337MB	H/H	16mS	£725

HD Controller Cards

• SCSI Hard Disk Controller Card	£15
• ESDI Hard Disk Controller Card	£165

P C Spares

• 101 Keys Pro Keyboard for XT/AT	£27
• 150W Power Supply (XT size)	£40
• 200W Power Supply (AT size)	£55
• Main Casing for PC XT	£25
• Main Casing for PC AT	£32

Memory

• 4164-10	£1.55	• 1MB-10 DIL	£4.50
• 4464-10	£3.50	• 1MB ZIP	£4.50
• 41256-10	£1.50	• 256K x 4 ZIP	£4.50
• 4256-8			£2.00

Simm & Sips

• 256K x 9-10	£14	• 1MB x 9-10	£36
• 256K x 9-8			£14.50
• 1MB x 9-8			£39

Add-On Cards

• EGA Card, 256K RAM, compatible with CGA, & EGA	£49
• XT/Advance Multi I/O Card: Dual FDC, Real Time Clock/Calendar, Serial/Parallel/Games Card	£18
• Second Serial Kit for above	£6
• XT/AT-Multi I/O Card: Serial Parallel Games Card	£9
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• XT/AT - Joystick/Games Card	£7
• Dual Serial (RS232) Card	£7
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Motherboards

Supplied complete with manual/driver software

• 286-20MHz Motherboard	£89
• 386-25MHz Motherboards	£149
• 486-20MHz Mboards/opt Cache	£POA
• 486DX-33MHz Mboards/opt Cache	£POA
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Ethernet Cards

8 bit with remote boot ROM, NE1000 Compatible	£68
16 bit with remote boot ROM, NE2000 Compatible	£68

PC Software

Please specify Disk size required (3.5"5.25")

• Autoroute Plus v4	£192
• Autoroute Express GB	£37
• Autosketch v3	£64
• Clipper v5	£295
• Coral Draw v2	£230
• D/Base III+	£339
• D/Base IV	£348
• Dataperfect	£233
• Datatalk v4	£82
• Desktop for Windows	£57
• Dexpress	£195
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• Display Writer v5	£245
• Designworks	£99
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• Foxbase	£182
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• Haward Graphics v3	£242
• IPhoto for Windows	£49
• Laplink Prp	£69
• Lotus 1-2-3 v3.1	£294
• Lotus 1-2-3 for Windows	£294
• Lotus Freelance	£245
• Lotus Symphony	£360
• Microsoft Basic Compiler	£195
• Microsoft C Compiler v6	£195
• Microsoft DOS v5.0	£49
• Microsoft Excel v3	£228
• Microsoft Pascal Compiler	£126
• Microsoft Quick C v2.5	£45
• Microsoft Word v5.5	£230
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• MS DOS 5 Upgrade	£49
• MS Flight Simulator	£26
• MS Quick Basic v4.5	£45
• MS Works for Windows	£230
• MS Word for Windows	£230
• Norton Anti-Virus	£84
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• Norton Commander v3	£83
• Norton Desk Top for Windows	£69
• Norton Utilities v6	£89
• Norton Utilities & Backup	£96
• Pagemaker v3	£255
• Pagemaker v4	£389
• Paradox 3.5	£349
• PC Tools v7	£70
• PC Tools Deluxe v7.1	£74
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• Sage Accountant	£169
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• Turbo Pascal for Professional v6	£117
• Turbo Pascal v6	£57
• Typographical Newsletter	£59
• Ventura Publisher Gold	£404
• Windows v3	£58
• Wordperfect v5.1	£159
• Word for Windows	£249
• Wordperfect for Windows	£197
• Wordstar v6	£198
• Wordstar for Windows	£210
• XTree Gold	£57

Graphics Cards

• Mono Graphics Card (inc. Parl port)	£12
• CGA Card - RGB Col and Mono with composite video (inc. parallel port)	£32
• Paradise EGA Card with 256K RAM (CGA compatible)	£45
• VGA Card - 8/16 bit with 256K RAM	£39
• SuperVGA Card 8/16 bit 512K RAM	£49
• SuperVGA Card 8/16 bit 1MB RAM	£79

Continued overleaf →



A4 Tech Products

• AM-5 Plus PC Mouse Package £15

High specification 290-1450 dpi resolution mouse with 600mm/s tracking speed, with Image 72 Paint software for EGA & VGA and mouse pad.

• AG-256 Grey Hand Scanner £119

High resolution switch selectable from 100-400 dpi hand held scanner. Selectable scanning of 2, 16 and incredible 256 grey shades with dial adjusted contrast for optimum performance. Supplied with Image 72 and Image 256 paint packages for EGA & VGA. Also supplied with the AG-256 is the incredible OCR Optical Character Recognition software package to convert scanned text images into ASCII text files.

• AC-4096 Col Hand Scanner £215

As above with 105mm scanning width but with selectable palette for 256 out of 4096 sensed colours. Full software control of colour hue, saturation and value provided with Image 72 mono and Image 256 colour paint packages for EGA & VGA.

Jan 1992 PC Plus Value Verdict ☒ ☒ ☒ ☒ ☐

"... The A4 is above average in terms of image quality... operation is remarkable straightforward... excellent results can be achieved... Overall this device can be recommended in comparison with the many other scanners I've tried..."

• A4Base II Col Image Database Software £39

Versatile and picturesque method of storing and retrieving scanned colour images. Combines text and graphics from images on screen. Up to 256 colours images capacity - ideal for slide shows.

CD ROM

Now is the time to buy a CD-ROM Drive. The Toshiba CD-Rom is the latest in compact disk technology using Toshiba KT-3301BA drives - the fastest on the market. Providing access to data in as little as 325ms from up to 683 Megabytes of information per disk at up to 1.5M per seconds, the Toshiba CD-ROM is your gateway to a wealth of knowledge and information.

Toshiba CD-ROM Drive, Internal **£369**
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Introductory software package worth over £400 including World Atlas, TIME History and the CD-Games Pack (when purchased with drive) **£59**

Goldstar CD-Rom Drive

The Goldstar GT2000 CD-Rom is an external drive, at less than the price of some internal drives! Bundled with the: The Times, Mammals Illustrated Encyclopaedia, and World Atlas CD-ROMs, and 500ms average access time. Introductory Offer **£339**

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Icontroller

Escape the mousetrap! The Icontroller is the ideal solution for those who want a mouse, but do not have the surface space to use one! The Icontroller is a joystick that thinks it's a mouse. It may be attached to the side of the keyboard, and features fingertip cursor control, dual cursor speed control, and three mouse buttons (Microsoft or Mouse Systems compatible). Includes storage case, desktop PC extension cable, 9 to 15-pin convertor, and software drivers. Escape the mousetrap!

£59

Sound Cards

- Aries Sound Booster Card **£99**
 - Aries Sound Booster Pro Card **£169**
 - Sound Blaster Card v 2.0 **£89**
 - Sound Blaster Card Pro Card **£175**
 - MCA Sound Booster Card **£159**
 - Aries High Quality Stereo Speakers **£89**
- (Write in or call for further information)

Genius Mouse

- GM-D220P New low cost mouse for PS/2 and Notebook PCs. Supplied with Driver software & manual. **£15**
- GM-D320 200-800 dpi. A low cost mouse for XT/AT. Supplied complete with Driver Software and manual. **£15**
- GM-6000 350-1050 dpi. **£19**
- GM-F303 350-1050 dpi X-Y movement, 2-3 button operation. **£25**
- GM-F303 350-1050 dpi as above supplied with PS/2 adaptor and Cas CAD software **£33**
- GMW220 State of the art infrared cordless mouse, ergonomic with built in charger & 2 rechargeable batteries. **£45**
- GM-M330 30-30,000 dpi another state of the art Optical mouse with Cas CAD 1 software. **£55**

N.B. Except for GM D220P & GM D320, all other mouse are supplied with mouse mat, mouse holder, DR Halo software, Genius menu maker and operating manuals. Mouse software is supplied on 5.25" disks, software on 3.5" disks, £5 extra.

Genius Handy Scanner

- GS-4500 Handy scanner is supplied complete with OCR and Scan edit softwares **£79**
- GS-B105G True 64 Grey level & 256 VGA grey mode. Ideal for 386 system **£125**

(N.B. Not compatible with Amstrad 1512.
All Software on 5.25" disks. For 3.5" disks please add £5).

Genius [A4] Flatbed Colour Scanner

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*Require Windows 3.x to operate

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- GT1812 18"x12" includes a 3 button stylus **£229**
- GT909 9"x9" includes a 3 button stylus **£89**

Above tablets are supplied with AutoCAD template, Dr Genius software & operating manuals. Software on 5.25" disks

- Spare Stylus for GT-1212 **£15**

Genius TrackBall

- GK-T320 TrackBall **£39**

Please telephone for further information on any of the Genius products.

HOW TO ORDER

By phone: To discuss your requirements call

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By post to:
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- DPX3500 **£2955**
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- HP 7440A **£415**
- DXY1200 **£625**
- DXY2500 **£2345**
- Sketchmate **£310**
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Commander Joystick is ideal for Games and Drawing programs. Features:

- Direct connection to a Joystick port.
- Fully compatible with all PC Joystick controlled games programmes.
- Switchable springs allow selection of floating or centring operation.
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Commander PC Joystick: **£16**



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Rainbow Colours — White, Red, Green, Orange, Yellow

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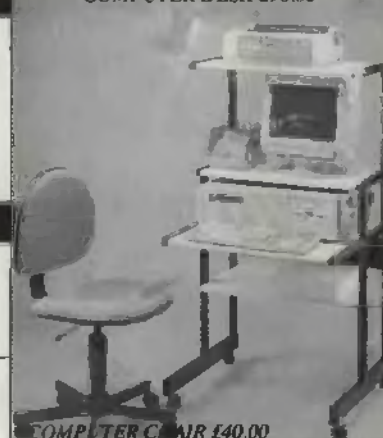
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DXY1100	£559
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LQ400	£169
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LQ870	£399
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LQ1170	£499
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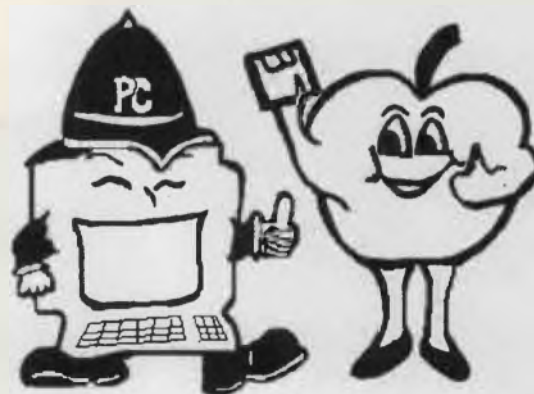
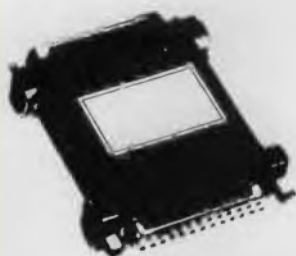
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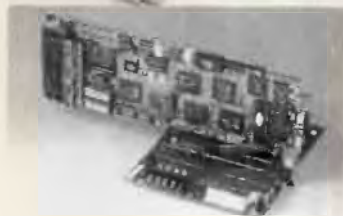
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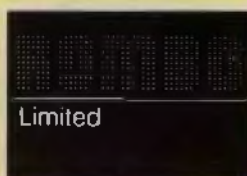
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4005 WAMPUM	Dbase III clone. Networking (HD1)
4008 GENEALOGY	Comprehensive family tree prog (2)
4010 CATALIST	Mailing list, labelling, lilofax (HD2)
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4014 FILE EXPRESS	Powerful easy learning (HD4)
4017 DEEP SPACE	Star maps + comets (2)
4024 PUNTERS PAL	Study form the easy way (1)
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5061 QUICK ROUTE	New UK printed CCT prog. (1)
6002 BACKGAMMON, CRIBBAGE + DRAUGHTS	Boardgames (1)
6003 PC-CHESS	Graphic versions. Many levels (1)
6004 SLEUTH	Detective graphic adventure (1)

PCW3

(HD) = HARD DISC; (TD) = TWIN DISC; (B) = GW-BASIC OR COMPATIBLE; FIGURE () DENOTES NUMBER OF DISCS IN SET

GAMES & MUSIC

6007 SAILING/CGA	Simulation Game (1)
6008 CAVEQUEST	Medieval strategy adventure (1)
6009 ADULT TRIVIA	Strictly for adults (1)
6010 SAM SPADE	Detective graphic adventure (1)
6014 CARD GAMES	Bridge, Canasta, Hearts & Poker (1)
6015 ARCADE 1	Collection of four games (1)
6016 ARCADE 2	Collection of many games (1)
6018 ARCADE 4	Collection of many games (1)
6019 STRATEGY 1	Collection of three games (1)
6020 CASINO 1	Collection of four games (1)
6021 COMPOSER CGA	Compose and print your own music (1)
6024 GOLDEN WOMBAT	Adventure game (1)
6026 AMULET OF YENDOR	Initiative game (1)
6030 JUMP MAN LIVES	Arcade Game. CGA/EGA/VGA (1)
6031 DARK AGES	Requires 286 or better. (HD1)
6032 RETURN TO KROZ	Graphics Adventure game (1)
6033 CAVERNS OF KROZ	(1)
6034 ARTIC ADVENTURE	(1)
6038 CROSSWORD CREATOR	Customised Entertainment (2)
6040 MAZE	Escape The Maze (1)
6041 FORD TEST DRIVE	Driving Simulator (1)
6043 MOSAIX EGA/VGA	Jigsaw puzzle (2)
6044 FORD SIMULATOR 2	Driving simulator (2)
6045 VGA MAJONG	Classic game of tiles
6046 CROSSWORD SOLVER	(1)
6048 MORAFF'S ENTRAP + FLY	Arcade Game (1)
6049 CAPTAIN COMIC EGA	Adventure game (1)
6056 MORAFF'S SUPERBLAST	EGA (1)
6059 MORAFF'S BLAST	EGA (1)
6060 SOLITAIRE CARD GAMES	inc Canfield, Vegas etc (1)
6062 COMMANDER KEEN	
6064 MONUMENTS OF MARS	Requires 286 or better (HD1)
6065 DUKE NUKEM	Requires 286 or better (HD1)
6066 PHAROAH'S TOMBS	Graphics adventure (1)
6067 CAVES OF THOR	Graphics adventure
7002 GALAXY	Word Star clone. Very fast (1)
7007 QWERTY	Beginners word-pro. Includes tutor (1)
7013 MINDREADER	Artificial Intelligence Word-pro (1)
7020 CHILDREN'S WORD PRO	A good intro for kids (1)
7021 HYPER-SHELL	Text Technology HD (3)
7035 TUTORIAL WRITER	Authoring system (1)
7038 SHARESPELL	Stand Alone Checker (1)
8001 CASHTRAC	Personal finance (HD2)
8002 HOME BUDGET	Home finance (1)
8003 FAST BUCKS	Personal finance (2)
8004 TIME & MONEY	Personal and small business accounts (1)
8006 LEDGER MASTER	Latest accounts pkge (HD4)
8007 MR BILL	Professional billing system (2)
8008 CHECKMATE GL	A full accounts business package (2)
8014 TRINITY	Personal Finance (1)
8015 OLIVE ACCOUNTS CONTROLLER	(HD2)
8020 RETIRE	Plan for the future (1)
8023 ULTIMATE SALES PROG	Sales + invoicing + stock etc (HD2)
8026 PAYE MASTER	New UK prog. (HD3)
8028 PAGE FINANCIAL CTRL	Accounts clone HD (2)
9004 WILDCAT	Bulletin Board system (HD2)
9005 KERMIT	Classic comms program (1)
9013 RBBS	Bulletin board HD (4)
9014 WEAK LINK	File Download Prog (1)
9015 EAZILINK	For View data/BBS (2)
9016 QVT	DEC Terminal Emulator (1)
A002 MARKETEER	Contacts Manager (HD2)
A003 PC-STOCK	Analysis of stocks and shares graphically (1)
A004 SURVEYSOFT	Calculation program for surveyors (1)
A005 ESTI-BID	Professional estimating & job costing (6)
A006 MAKE MY DAY	Time scheduling, expenses etc (2)
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A010 SUPERSTOCK	U.K. Stock program (HD1)
A011 DESKTEAM	Memory resident desktop (1)
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A040 INVENTORY MASTER	Stock Control Prog (1)
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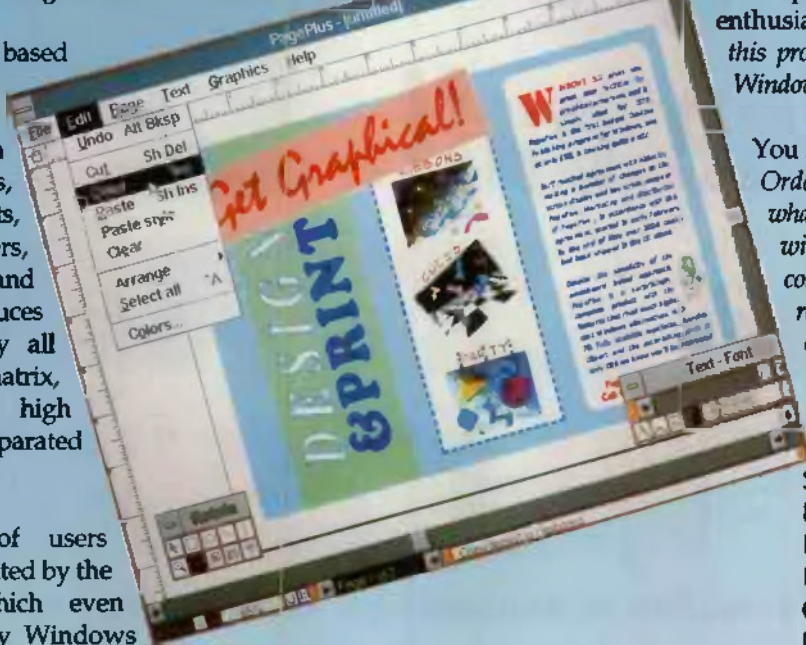
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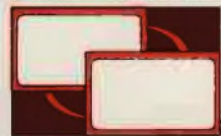
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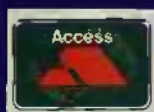
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Bits & Pieces

February was a very bad month for people's names — we only got one wrong in the whole issue! Richard (the robot designer) Buckley's real Christian name is actually David.

The only thing Darrell King, our Art Editor, had to say about February's issue was: 'Whatever you put in ChipChat, don't mention the Dell photograph on page 218. I don't want to draw any more attention to it.' I won't mention it, but I don't think Darrell wants to see any *PCW* reader holding their copy upside down.

Never let it be said that we don't test computers thoroughly at *PCW*. We have the Whetstone test, the Dhrystone test, and now we have the Johnstone test. Last month, Helen Johnstone, our deceptively physical staff writer, sent her PC sumersaulting off the desk during one particularly violent typing frenzy. The machine plummeted floor-bound, bounced, and landed on its back, rubber feet waving in the air; and still running happily...

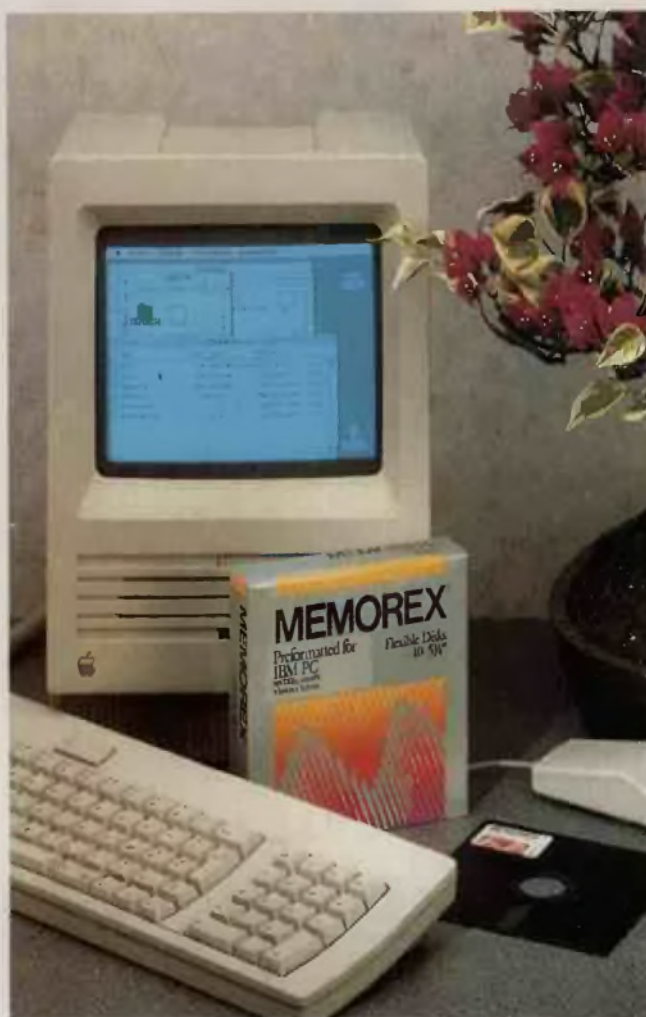
Not to be outdone, our Features Editor, Simon Rockman, reviewing the new and rare (only a handful in the country) Sharp 6700 SL notebook, had his own particularly violent brainstorm. For no reason other than inadequate numbers of synchronised braincells (well, you've got to have something missing to work in this office), he chose to run a file in the Sharp's \UTILS\ directory, innocently named GO.BAT. Result — a zeroised Flash BIOS. 'Oh,' said the man from Sharp, 'you realise it will now have to go back to Japan'...

The notorious 'Radio WordPerfect' telephone support (see last month's ChipChat) is already impressing readers. One DrawPerfect user, having finally got past the Jimmy Young sound-alike, began a fascinating technical discussion on one of the pack-

age's features. Eventually the support person on the end of the phone owned up. He'd never heard of the feature; his manuals were so out of date it wasn't even mentioned...

It's finally time for all you closet information technologists to come 'out': it's now respectable and that's official. A press release from a Mr Tinsley-Wickes proclaims that the Worshipful Company of Information Technologists

will be invested with liveried status by the ancient City institution, the Court of Aldermen. Wow! Sounds worse than the Masons. Forget Novell; you can now connect into the really powerful old boys network. So if you fancy yourself as part of this bizarre band of chaps, can recognise a floppy disk at 500 furlongs and like wearing wigs and flouncing around in doublet and hose, join up now...



Will all Mac owners who run DOS on their machines and use 5.25in disks please put their hands up? Memorex would like to speak to you. (So would we!) In its computer supplies catalogue Memorex assures us that the pictured DOS pre-formatted disks are 'ready to use the moment they're unpacked'...

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Automatic envelope-handling, for easy mail-merge.



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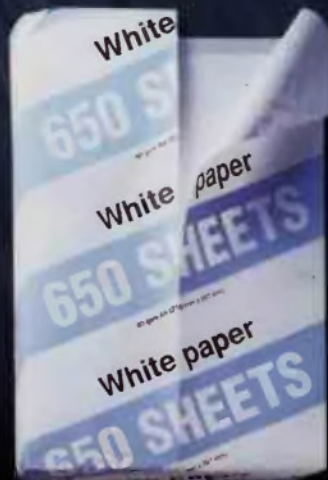
This is what came out.



79 pre-loaded fonts.



Overhead film and label printing facilities.



650-sheet total capacity, as standard.

Isn't it time someone produced a laser printer that provides what users really need?

Anybody would like, for example, the convenience of two paper trays. So why move up in price, and pay for other features you don't need, just to get them?

Why should envelope-handling come as an extra - after all, in what else can you send letters?

And why should high paper capacity be only for big, expensive printers?

We don't know why, either. Which is why we've produced the new F-820 laser printer ...

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See for yourself. *Laser Printers: A Purchaser's Guide* is yours, free, when you use the coupon.

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